Contingent Factors Affecting Budget System Usefulness:

An Information Processing Perspective

by

Jack M. Cathey

Dissertation submitted to the Faculty of the

Virginia Polytechnic Institute and State University

in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Business Administration

with a major in Accounting

APPROVED:

_____
Dr. W. E. Leininger, Chairman

_____   _____
Dr. T. W. Bonham   Dr. L. N. Killough

_____   _____
Dr. P. R. Sopariwala   Dr. L. M. Wolfe

April, 1989

Blacksburg, Virginia

Contingent Factors Affecting Budget System Usefulness:

An Information Processing Perspective

by

Jack M. Cathey

Dr. W. E. Leininger, Chairman

Business Administration

(ABSTRACT)

An examination of the management accounting systems literature revealed the need for additional research based on a contingency perspective. Specifically, additional empirical research based on a well articulated theory.

A theoretical model was developed building on Galbraith's theory of organization structure. Two sources of uncertainty -- environmental uncertainty and task uncertainty -- were viewed as forming the information processing requirements faced by the organization. In response to these requirements, organizations were viewed as adapting by altering their level of decentralization and their use of budget systems. Organizational effectiveness was achieved by a proper fit between the uncertainty faced by the organization and these responses.

Data were collected from business unit managers using a survey instrument. A total of 103 usable responses were obtained with an overall response rate of 49%. Previously developed measures were used for all variables except for budget

system usefulness. A measure for this variable was developed and validated. The data were examined using path analysis.

The data did not support the model. Problems encountered in the use of perceptual measures for the uncertainty variables appeared to be the most likely explanation for the weak results. However, when the data was split based on the performance measure an interesting result was observed. Specifically, the relationships between the uncertainty measures, decentralization, and budget system usefulness were different for the low and high performance group. An explanation for this finding was offered.

Acknowledgements

No project of this magnitude is completed without the significant involvement of a number of individuals. I will attempt to acknowledge the many individuals who have contributed to this dissertation.

I would first like to thank the members of my committee. Dr. Wayne E. Leininger, both as my dissertation chairman, and Department Head, has provided invaluable support, encouragement, and guidance throughout my graduate studies. Dr. T. W. Bonham has contributed through his knowledge of both organization theory and survey methods. I am grateful of the assistance of Dr. L. N. Killough for my training in the doctoral seminars and his participation in this project. Dr. P. R. Sopariawala contributed, especially in his keen editorial eye and helpful suggestions. Finally, I wish to thank Dr. L. M. Wolfle for his significant assistance in planning and performing the data analysis.

Two other faculty members deserve recognition. Without the help of Dean Richard E. Sorenson the data collection would not have been possible. Also I wish to thank Dr. Gary M. Cunningham for stimulating my initial interest in management control systems.

The success of this project is due in no small part to a number of business people who participated in the survey. I would like to acknowledge the very helpful

contributions of   ,   , and   , who all

provided invaluable insight and assistance in the design of the instrument.

I would like to thank the many friends who have encouraged me during this

experience. I wish to thank   ,   ,   ,

            , and especially,   who were my roommates at various points

during graduate school. The friendship, challenge, and helpfulness of my fellow

graduate students in the Department of Accounting will never be forgotten. I

also wish to thank the members of my House Group from Blacksburg Christian

Fellowship including   ,   ,   , and

            . Two other friends,   and   , have made

this a less lonely road to walk. Finally, I want to say thank you to

            for allowing me to share many of the joys and trials of my doctoral

experience.

My family is most deserving of acknowledgement for without their love I would

never have completed this project. To my mother: thank you for giving me a joy

in learning. To my father: thank you for giving me a joy in working. To my

brother: thank you for sharing the dissertation experience.

Lastly, I would like to thank my Lord and Savior, Jesus Christ. He has given

me an abundant and meaningful life. Without Him I am nothing. It is to Him

that I dedicate this dissertation. To God be the glory.

Table of Contents

List of Illustrations

List of Tables

Chapter 1

Introduction

1.1 Background

Contemporary accounting research focusing on the design and use of

management accounting systems is dominated by a "contingency approach"

(Otley, 1980). Otley provides a concise overview of this approach:

> The contingency approach is based on the premise that there is no universally
> appropriate accounting system which applies equally to all organizations in all
> circumstances. Rather, it suggests that particular features of an appropriate
> accounting system will depend upon the specific circumstances in which an
> organization finds itself.(1980, p. 413)

The contingency approach in management accounting systems research has come

to replace the earlier universal approach. In contrast to the contingency

approach, the universal approach is based on the premise that a universally

appropriate accounting system exists, independent of unique organizational circumstances. Hofstede's (1968) study of budgetary control is an example of the universal approach.

The development in the management accounting systems literature from a universal approach to a contingency approach is due, in no small part, to a parallel and preceding development in the field of organization theory. Organization scientists such as Taylor (1911) sought to determine the universally best form of organization. The collective work from this perspective is often called "classical management theory" (Morgan, 1986) and can be characterized by principles such as unity of command and division of work.

Challenges to the universal approach appeared beginning in the 1960s. Seminal work by scientists such as Burns and Stalker (1961) and Woodward (1965) introduced the idea that no single form of organization would be universally superior, but rather that the form adopted would be *contingent* on the environment of the organization (Morgan, 1986, pp. 48-54). The idea of contingency gained momentum with the articulation of general systems theory and particularly open-systems theory by scientists such as von Bertalanffy (1968) and Kast and Rosenzweig (1973). By the middle of the 1970s contingency approach was recognized as dominant in the field of organization theory (Child, 1977).

Thus, from developments within the accounting literature and from the supportive field of organization theory, the contingency approach has spawned a number of research efforts. These efforts first appeared in the early 1970s and have continued to the present. Accounting researchers have followed the contingency approach along both theoretical and empirical fronts.

1.2   Nature of the Problem

While the contingency approach has become the dominant approach in management accounting systems research, there are many significant issues presented by this approach that are, as yet, unresolved. Otley, in a review of the contingency theory literature in 1980, stated that a formal contingency theory "must identify *specific aspects* of an accounting system which are associated with *defined circumstances* and demonstrated an *appropriate matching*" (p. 413, emphasis from the original). Otley, somewhat pessimistically, concluded that the extant research had "produced few significant results" (Otley, 1980, p. 413). However, rather than proposing that the contingency approach itself was at fault, Otley argued that extant research had been based on "an inadequate and insufficiently articulated model." (1980, p. 413).

The goal of an "adequate and sufficiently articulated" contingency-based model of management accounting systems design and use has not been fully achieved

since Otley's review. In fact, while progress has been made on some fronts, several of the studies published appear to have virtually ignored Otley's call for a more sound theoretical base. Therefore, additional research, built upon strong theoretical foundations, is called for.

1.3 Statement of the Problem

A number of research questions are suggested by this brief review of the contingency approach to management accounting systems research. The primary question is: Can a suitable theory be identified which will provide a basis for empirical research of management accounting systems following a contingency approach? Assuming that such a theory can be identified, a second question immediately follows: Can this theory be empirically tested? A third question is: Will this theory, if identified and if tested, be supported by the empirical results. Finally, assuming a positive answer to each of the three previous questions, What are the implications for future research and for management accounting practice?

1.4   Significance of the Problem

At one level, the motivation for this research flows from the shortfalls of the research performed in this area to date. However, at a higher level, an even more compelling argument may be made for the significance of this research.

Modern business organizations have and utilize management accounting systems. This can be demonstrated by the results from several surveys of management accounting techniques. For example, Imhoff (1978) found that seventy-four percent of the responding firms in his survey use budgets as a significant factor in evaluating members of management and over seventy-two percent of the organizations responding to the survey used flexible budgeting. Cress and Pettijohn (1985) report the results of a survey in which close to eighty-four percent of the respondents indicated that they prepared budgets including pro-forma income statements. Abdallah and Keller (1985) found that eighty-six percent of the multinational enterprises in their sample evaluate foreign subsidiaries by comparing budgeted profit to actual profit.

However, while management accounting systems are used in a large majority of business organizations, it is not clear that many facets pertaining to the design and use of these systems are well understood. Brownell (1982), in a comprehensive review of the participation in the budgeting process literature, made the following statement: ". . . the literature remains fraught with

contradiction, overlap and a general lack of conclusiveness on the question of whether participation works or not (p. 124)." More recently, Johnson and Kaplan (1987) have gone so far as to question whether current management accounting practices are not at least partially responsible for the declining productivity of American manufacturing firms vis-a-vis their international competitors.

To summarize, management accounting systems are extensively used, but not well understood. This lack of understanding of such an ubiquitous phenomena forms the primary motivation for this research project.

1.5   Organization of the Dissertation

This dissertation is organized into a total of seven chapters. The first chapter, which this section concludes, contains an introduction to the research reported in this dissertation. The background, nature, statement and significance of the problem have been presented.

Chapters 2 and 3 contain a report of the results of a review of the management accounting systems literature. The research utilizing the contingency approach will be divided into two groups: the theoretical literature which will be reviewed in Chapter 2 and the empirical literature which will be reviewed in Chapter 3. Following a detailed review of these two groups of literature, a synthesis, summary, and critique of their findings will conclude Chapter 3.

The development of a contingency-based model of management accounting systems is presented in Chapter 4. In addition, this chapter will include the research propositions to be examined. An explanation of the research methods which were used to empirically test the model is included in Chapter 5.

Chapter 6 will include a report of the results from the empirical test. Finally, Chapter 7 will contain the conclusions which can be drawn from the research performed. In addition, the limitations and future extensions will be presented in this final chapter.

Chapter 2

Literature Review - Theoretical Literature

2.1 Introduction

A review of the relevant literature is presented in this chapter and the next. It is intended to provide a summary of the theory, methods, and findings of research into management accounting systems design and use based on the contingency approach presented in the introduction. Furthermore, this review of the literature is intended to expose weaknesses, limitations, unresolved issues, and opportunities for additional research.

Before the literature review itself is presented it will be useful to explain how the literature reviewed in these chapters was identified and selected. The following two-step process was performed to identify the relevant literature. First, the table

of contents of each issue of the *Journal of Accounting Research* and *The Accounting Review* during the period from 1970 until the present was scanned. Every article dealing with contingency theory, budgeting systems, management control systems, and management accounting systems was recorded. The cut-off year of 1970 was selected arbitrarily and was intended to include the period in which contingency approach research would have been reported and also to include the research which would have immediately preceded the contingency approach research. In an identical fashion, the table of contents of all of the issues of *Accounting Organizations and Society* was reviewed.[1] These three journals were selected because they appeared to be the primary publication outlets for contingency theory-based research during this period. Other journal were also considered as will be explained in the following paragraph.

Next, the bibliography of each article identified in the first phase was reviewed. References to additional relevant literature, both within and outside of accounting, were noted. Special attention was given to accounting articles in the pre-1970 period and to articles appearing in the organization theory literature. While an exact count of the total number of references identified by this process was not computed, well over one-hundred references were identified.

After identifying what appeared to be the relevant body of literature it was divided into two major categories: the non-accounting studies, primarily in the area of organization theory and the accounting studies. The non-accounting

---

[1] Volume 1 of *Accounting, Organizations and Society* was published in 1976.

studies were closely reviewed; however, as they are one step removed from the research presented here, they will not be explicitly reviewed in this dissertation. Instead, they will be referred to and examined, as necessary, during the remainder of this report.

The accounting studies themselves will be reviewed in the next two chapters. Chapter 2 will include the theoretical papers which have followed the contingency approach while Chapter 3 will include the empirical studies. It should be noted that this dichotomy is somewhat artificial in that the majority of the theoretical papers, while not presenting empirical results themselves, do refer to empirical findings reported elsewhere. Likewise, the empirical papers, to a greater or lesser extent, often present some theory which their study was designed to examine.

The detailed reviews of both the theoretical and empirical literature will each be concluded with a summary of the studies reviewed. After the detailed review of both bodies of literature is complete, Chapter 3 will conclude with an integration and synthesis of the extant contingency approach literature. In addition to commonalities, a number of deficiencies and opportunities for additional research will be noted.

2.2   Theoretical Literature

A number of theoretical papers have been published in the accounting literature which have followed the contingency approach. Before each of these papers is reviewed in detail, a brief review of several early papers which provided a foundation on which the contingency-approach research was built will be provided.

2.2.1   Early Literature

As was mentioned in Chapter 1, the contingency approach has developed as a response to the short comings of the universalistic perspective which dominated the literature during the 1960s. E. A. Lowe and J. M. McInnes in two early papers (Lowe, 1971; Lowe and McInnes, 1971) pointed away from the universalistic perspective. In these papers the proposition is advanced that an organization, and implicitly a management accounting system, is best viewed as an open-system. For example, Lowe and McInnes state: "Thus we are concerned with *the structure of the enterprise as a system*, i.e., the relationships of the elements within the enterprise, and also with the behavior of the enterprise, as a whole, in relation to its environment" (1971, p. 218, emphasis from the original). The open systems perspective proposed in these papers represented a movement

away from earlier closed-system, cybernetic models which often ignored system-environment interactions.

Building on the idea that both organizations and their accounting systems may fruitfully be viewed as open systems, Sathe (1975) and Watson (1975) began to explore the implications of the contingency theory of organizational structure on management accounting research. While Sathe (1975) primarily reviews the literature, Watson (1975) attempts to explore its implications more fully. These papers represent the first clear articulation of the idea that management accounting systems research could benefit by consideration and incorporation of the contingency perspectives developed in the field of organization theory.

2.2.2 Detailed Reviews

The initial proposal that management control systems and management accounting research should be developed from an open-systems perspective and be built on the contingency theory of organization structure were rapidly and heartily accepted. A number of theoretical papers appeared during the second half of the 1970s and the first half of the 1980s.

The papers included in this review of the theoretical literature were identified using the following criteria. First, the focal system must directly include some component of, or relationship with, the managerial accounting system. This

criterion excludes those papers which employ the contingency approach but do not focus on management accounting systems. For example, using this criterion Thomas (1986) was excluded because, even though the paper took a contingency approach, the focus of the paper was on financial accounting choices. Secondly, the theory advanced must have its origins in the open systems/structural functionalism paradigm. This criterion excludes the management accounting papers which do not rely on the contingency perspective. For example, while Otley and Berry (1980) develop a theory about accounting information systems, which includes the management accounting system, their primary paradigm is that of cybernetic theory. The conjunctive use of these criteria provided a method to eliminate papers which were not clearly related to the present study.

Five papers were selected using these criteria and will now be reviewed individually. For each paper reviewed a discussion of its motivation, model or theory, implications and conclusions, and the primary contributions and criticisms of the paper will be detailed.

2.2.2.1   Gordon and Miller (1976)

An article by L.A. Gordon and D. Miller appearing in the in inaugural issue of *Accounting, Organizations and Society* (Gordon and Miller, 1976) presented the first complete theoretical analysis of an "accounting information system" developed following a contingency approach. These authors indicate that their motivation is to challenge the universalistic perspective. They begin by stating,

"For the most part, the efforts to date have been directed at searching for the single most desirable method of generating financial data promote efficient decision making " (p. 59).[2] And later, "Our objective is to provide a framework for designing accounting information systems which consider the *specific needs* of the organization." (p. 59, emphasis in the original).

A model is constructed, drawing from organization theory, management policy, and accounting literature. This model is presented in Figure 1 on page 15. The model contains four key variables which are the environment, organization, decision making style, and accounting information system. The authors represent that the accounting information system has the following characteristics (pp. 59-60.):

1. information load
2. centralization of reporting
3. cost allocation methods
4. frequency of reporting
5. method of reporting
6. time element of information
7. performance evaluation
8. measurement of events
9. valuation methods

The major section of the paper presents an analysis of the relationship between the accounting information system (and its characteristics) and each of the three other variables. In each case this is accomplished by specifying the dimensions of each variable and then considering the impact of each dimension on the

---

[2] Throughout the detailed reviews in this chapter and the next abbreviated references will be used for the article being discussed.
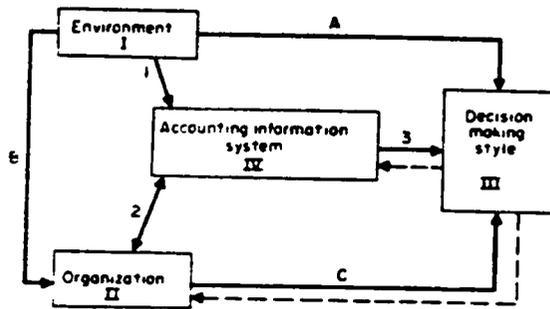
Figure 1. Gordon and Miller's Model: Source - Gordon and Miller, 1976, p. 59.

characteristics of the accounting information system. For example, the dimensions of the environment are reported to be dynamism, heterogeneity, and hostility. The impact of higher levels of environmental dynamism on the accounting information system are more nonfinancial data, increase reporting frequency, more use of forecast information, and more likely to expense rather than capitalize costs which might benefit future periods.

The balance of the paper includes a discussion centering around three archetype clusterings of environmental, organizational, and decision styles. These archetypes are adaptive, running blind, and stagnant bureaucracy and were developed in previous research of one of the authors (Gordon and Miller, 1976, pp. 65-68.). A description of the requisite accounting system characteristics for each archetypical firm is also included. The authors conclude in calling for a more contingency-based research in accounting and propose that the model presented in this paper can provide a basis for this research.

The significance of this paper is that the contingency perspective was presented as a superior alternative to the universal perspective. As noted earlier, this paper is the first to provide a somewhat detailed, contingency-based, model as an alternative to the universal view. Further the authors relied on the organizational theory literature as a basis for several of their model's variables and the dimensions of these variables.

Gordon and Miller (1976) may be criticized on several counts. First, the paper is extraordinarily ambitious. The authors attempt to tie together three fields of study - organization theory, business policy, and decision style. Each of these fields contains complex and, as yet, murky theories and findings. To accomplish such a unification is perhaps not a reasonable task. Secondly, and clearly related to the first criticism, Gordon and Miller often fail to provide strong support for, and clear explanation of, the characteristics and dimensions of their model's variables. For example, there is no indication of the source as exhaustiveness of the nine attributes of accounting information systems.

2.2.2.2 *Waterhouse and Tiessen (1978)*

The second major theoretical paper in the accounting literature to adopt the contingency approach in discussing the design of management accounting systems was written by J.H. Waterhouse and P. Tiessen (Waterhouse and Tiessen, 1978). These authors position their paper as an attempt to discuss management accounting system design issues using the organizational level of analysis and differentiate this level of analysis from the bulk of management accounting research which has been performed at the individual level of analysis relying heavily on psychological and interpersonal variables.

The model described in Waterhouse and Tiessen (1978) is fairly straightforward. They begin by citing the contingency theory of organization structure literature. Next, a model of an organizational control system is developed. This model may

be summarized as follows. The structure of an organization is determined by the environment and the technology of the organization. Environment is conceptualized as ranging from highly predictable to highly unpredictable. Similarly, technology is conceptualized as variable from routine to non-routine.

Using these two contextual variables, the following contingency scheme is presented. The nature of an organization's control system is dependent on the type of organizational structure, which is dependent on the technology and environment of the organization (p. 68). Thus a link between the contextual variables and the organizational control system is made.

Next a general tendency of organizational control is proposed. Waterhouse and Tiessen suggest that, subject to the constraints of their technology and environment, organizations will prefer more centralized to decentralized distributions of decision-making authority (p. 69). A cost-benefit argument is invoked to justify this proposal. In centralized authority structures, lower-level member's duties will be prescribed by higher level members.

It is recognized that not all organizations will face environmental and technological constraints which allow procedure specification for lower-level tasks. In these cases a decentralization of decision-making authority is expected. Once decision-making authority has been decentralized there will need to be a change in the organization's control system. Whereas in centralized authority situations control was accomplished directly by observing compliance with

prescribed procedures (process control); control is expected to be accomplished by controlling inputs and outputs in decentralized authority situations. Furthermore, in high environmental and technological uncertainty contexts a greater reliance on professionals will be expected.

The implications of this model on management accounting systems is examined in the next section of the paper. Three aspects of management accounting systems were considered. First, the planning and resource allocation aspects of the management accounting system were discussed (pp. 72-73). Centralized firms were expected to have decreased emphasis on planning through the budgeting process vis-a-vis decentralized firms. Secondly, performance measures were considered (pp. 73-74). Relying on results of prior empirical work, Waterhouse and Tiessen indicate that traditional management accounting system performance measures will prove to be more effective in centralized organizations than in decentralized organizations.

Waterhouse and Tiessen conclude their paper admitting that the contingency theory literature is lacking in both conceptual and methodological clarity and that evidence supporting the link between contextual and organizational variables with increased levels of effectiveness is weak (p. 74). However, they conclude that this approach appears to have great potential.

The contribution of Waterhouse and Tiessen (1978) is similar to that of Gordon and Miller (1976). Their paper provides a conceptual model for management

accounting system design and use which explicitly was developed following the contingent approach. Furthermore, Tiessen and Waterhouse's model, more so than Gordon and Miller's, was derived from and relied upon the contingency literature from organization theory.

2.2.2.3   Otley (1980)

David Otley developed, as a part of his review and summary of the contingency theory literature, an expanded model of management accounting information systems design and use (Otley, 1980). Otley begins by tracing the development of the contingency approach. After tracing this development he concludes that the extant contingency approach is lacking because it has "implicitly utilized an inappropriately simple model" (p. 419). In order to remedy this situation Otley develops a more complex model.

The model proposed by Otley is shown in Figure 2 on page 21. The model contains five major categories. The first category are the contingent variables. This category includes those variables which are outside the control of the organization. In addition, the organizational objectives are included as a controllable, yet contingent variable.

In response to the collection of contingent variables an organization will arrange a second major category of variables -- the organizational control package. This package consists of an AIS design, other MIS design, organizational design, and

Contingent variables

| Variables that cannot be influenced by the organisation | Organisational objectives |

Organisational control package

AIS design ⟷ Other MIS design ⟷ Organisational design ⟷ Other control arrangements

Intervening variables

Other factors

Organisational effectiveness
(measured in relation to objectives)

The minimum necessary contingency framework.

Figure 2. Otley's Model: Source - Otley, 1980, p. 421.

other control arrangements. Each of these elements is viewed as being so tightly interrelated with the other elements that they "can only be evaluated as a whole" (p. 422).

The third category of variables included in the model are those intervening variables which mediate between the organization's control package, the contingent variables and the overall effectiveness of the organization. The final category is the host of other factors which directly effect the overall effectiveness of the organization, but not in an intervening manner.

Otley draws a number of implications from this model for management accounting research (pp. 422-425). First, he suggests, the interdependencies between management accounting information systems and other mechanisms of organizational control must not be ignored. Instead, these must be explicitly considered in any research performed. Secondly, he proposes that future research must demonstrate that increased levels of effectiveness result from a fit between of the organizational control package and the contingent variables. Lastly, he proposes that future research be conducted using qualitative methods rather than cross-sectional, hypothesis testing, statistical methods which have been employed in early research in this area.

The significance of Otley's review and proposed model is immense. Otley's review appeared reasonably early in the development of the contingency approach within management accounting. At the time it was published only a few

theoretical and empirical papers explicitly developed from a contingency perspective had been published. Positively the paper challenged researchers to avoid simplistic models or even worse no models at all. Furthermore, the model presented proposed the criterion variable of organizational effectiveness must be demonstrated before contingency findings could provide practical advice.

However, the paper may have also negatively contributed to the field. First, the model presented, while clearly more complex, lacks sufficient specificity to guide future research. For example, there is not even a partial listing of the contingent variables which cannot be controlled by the organization. Presumably, from the earlier discussion, these include technology and environment; however, no clarification is provided. Secondly, when the detailed items included in the various categories of variables are at least partially provided, as is the case with the organizational control package, no definitions, boundaries, or referents are given. Thus, the future researchers are left with the difficult task of determining not only the interrelationships between AIS design, other MIS design, and organizational design, but specifically to what these terms refer.

2.2.2.4   Flamholtz (1983)

Eric Flamholtz accepted Otley's challenge that future contingency approach research should avoid simplistic models and should recognize the significant interrelationships which exist between various components of an organization's
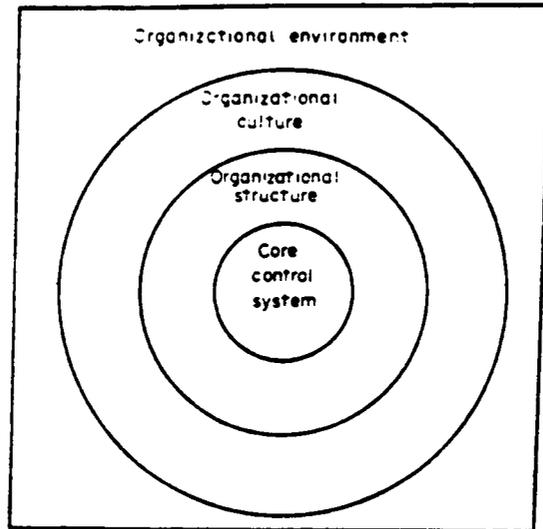
Schematic representation of an organizational control system.

Figure 3. Flamholtz's Model - Organizational Control System: Source - Flamholtz, 1983, p. 155.

control system. His response to this challenge is contained in Flamholtz (1983). However, rather than critiquing or extending Otley's model, Flamholtz developed a new model of an organizational control system. This model is presented in Figure 3 on page 24.

Flamholtz's defines organizational control as "any actions or activities taken to influence the probability that people will behave in ways which lead to the attainment of organizational objectives" (p. 154). He further suggests that control is an inevitable result of the conflict between the individual goals of organizational members and the goals of the organization itself.

The organizational control system consists of three imbedded components - the core control system, the organizational structure, and the organizational culture. The three components are immersed in the environment of the organization.

The core control system, in its most highly developed form, consists of four processes (subsystems). These are planning, operations, measurement, and evaluation-reward. These four processes are interrelated and are presented in Figure 4 on page 26. As can be seen in this figure these processes are related by a series of feedback and feedforward loops.

After providing a detailed description of each of the processes of the core control system, Flamholtz explains the relationship between these processes and the less abstract accounting and budgeting systems. He states that the accounting system
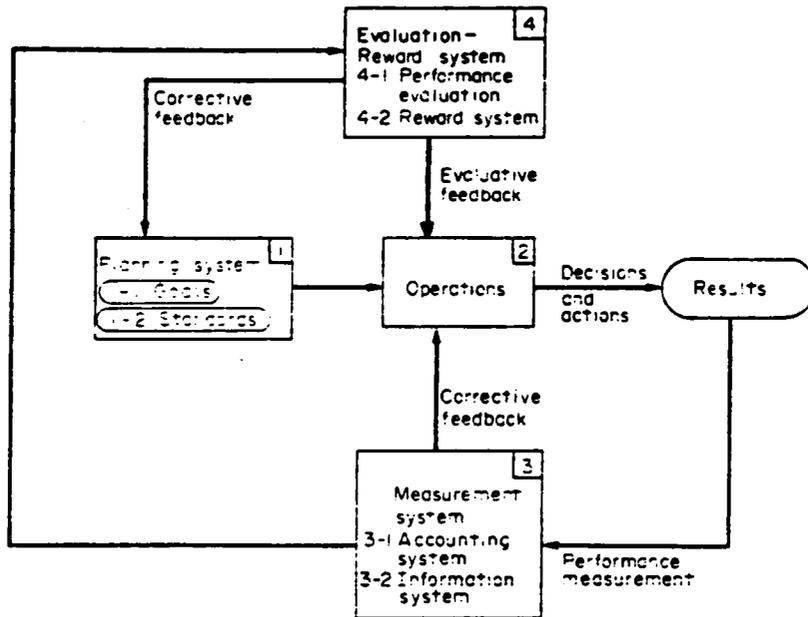
Schematic model of the cone control system.

Figure 4.   Flamholtz's Model - Core Control System: Source - Flamholtz, 1983, p. 155.

is a part of the operations and measurement subsystems and the budget system is a part of the planning, operating, and measurement system (p. 156). Flamholtz therefore concludes that since both the accounting and budgeting systems are not individually a part of all four subsystems of the core control system, they cannot be viewed as being equivalent to the whole control system (p. 156).

Flamholtz then proceeds to discuss four possible configurations of the core control system elements. These configurations provided different amounts or levels of control as the individual core control subsystems are added and interrelated.

The remaining two components of the organizational control system are developed next. The organization structure is viewed as a component of control which has imbedded within itself the core control system and is imbedded within the organizational culture. The structure is viewed as having four dimensions consisting of the degree of decentralization, functional specialization, degree of vertical and horizontal integration, and the span of control. Organizational structure is viewed to be static relative to the dynamic interrelationships in the core control system. Furthermore, organizational structure is viewed to be a strategic response to an organization's markets, technology, and environment.

The final component of the organizational control system is the culture of the organization. Organization culture is defined as "the set of values, beliefs, and social norms which tend to be shared by its members and, in turn, tend to

influence their thoughts and actions" (p. 158). The organizational culture is specified as a component which "determines (or at least is thought to determine) the nature of the other components" (pp. 158, 159).

After explaining the model, several implications of the model were provided. The first implication is that any conceptualization of control systems which is limited only to accounting-measurement systems is not adequate in that such a conceptualization ignores the other components of the control system and their interrelationships. It is noted however, that if budget systems, which are defined to normally include only the planning, operation, and measurement subsystems, are linked to the evaluation-reward system that such a system could be viewed as a core control system.

The second implication is that the three components of organizational control presented - organizational culture, organizational structure, and core control system - must be designed in a consistent fashion. Failure to understand this will result in the reduced effectiveness of the organizational control system.

A third implication is that the core control system may be seen as a vehicle for organizational change and may be used to bring about changes in the other components of control, namely structure and culture. The remainder of the paper contains a discussion of three case studies of actual organizations which are analyzed from the perspective of the model presented in the paper.

Flamholtz (1983) makes at least three important contributions to the theoretical literature. First, an additional component of the overall organizational control system, the organizational culture, is recognized. Organizational culture has received significant attention in the organizational theory literature[3] however no previous contingency model had explicitly included this component. Secondly, Flamholtz' conceptualization linked the contingency literature to the cybernetic literature, and in doing so, provided a much more clear conceptualization of such basic organizational control processes as planning, operations, measurement, and evaluation-reward. This clarity is most notable relative to the vague and tangled components presented in Otley (1980). Lastly, Flamholtz made an attempt to link his model to actual organizational phenomena such as budgeting systems. Previous research had achieved only limited success in such a linking.

Flamholtz (1983) may also be criticized in several ways. The paper does not offer any connection between the model which is presented and previous models. In fact, Flamholtz does not even reference Gordon and Miller (1976), Waterhouse and Tiessen (1978) and Otley (1980). Thus, the model presented must be viewed as, yet another, competitor model and any relationship, extension, or superiority from previous theoretical development is left to the reader.

A second criticism of Flamholtz is that several interrelationships between the three components of the organizational control system are not spelled out. For example, there is no discussion on the relationship between the organization's

---

[3] See, for example, Ouchi, 1979.

environment and its culture; however, the model conceptualizes the culture as a buffer between the environment and the structure and core control system of the organization. Similarly, the relationship between the core control system and the organizational structure is also not discussed. While it is stated that these systems must be compatible, no indication of the nature of such a compatibility is provided.

A final criticism is that no attempt was made to link proper control system configurations to higher levels of organizational effectiveness. This shortcoming is particularly striking as the model is built from its start on the notions of organizational goals, a key element in most conceptualizations of organizational effectiveness. The failure to include effectiveness removes the force which drives organizations to align the components of their control system.

2.2.2.5 Flamholtz, Das, and Tsui (1985)

T.K. Das and A. Tsui collaborated with E. Flamholtz to expand the original model presented in Flamholtz (1983) in Flamholtz, Das, and Tsui (1985). The expressed objective of the paper is to "provide the nucleus for developing an integrative theory of organizational control" (p. 35). The theory presented attempts to integrate the theory and findings from the sociological, administrative science, and psychological literature and, correspondingly presents a view of organizational control at the organizational, subunit, and individual level analysis

(p. 35). Furthermore, the integrative theory is derived from a combination of the cybernetic and open systems perspectives.

As the bulk of the model presented is identical to the model presented in Flamholtz, no further explanation or comments are needed. However, several additional insights are gained from the somewhat expanded discussion in this paper. First, the relevance of organizational effectiveness is recognized explicitly in this presentation. Organizational effectiveness is presented as the ultimate goal of organizational design and thus the model presented.

A second difference is the clearer derivation of the model's components. The core control system is the primary focus of the model and is derived primarily from cybernetic theory. The remainder of the model, termed the control context, which includes the organizational structure and culture, along with the external environment, is the secondary component of the model and is grounded in open systems literature. The secondary role of the control context is indicated, not only by the brief description which is given to it, but also by the discussion of its relationship to the core control system. Rather than proposing that the control context forms a contingency to which the core control system must adapt, the control context is represented as an additional, but apparently not significant variable which either limits or enhances the effectiveness of the core control system.

The primary contribution of Flamholtz, Das, and Tsui (1985) is therefore the further clarification of the components and interrelationships within the core control system, along with substantial references for these elements of the model originally presented in Flamholtz (1983). Each of the criticisms leveled at Flamholtz (1983), with the exception of the exclusion of the criterion of organizational effectiveness may also be applied to this paper.

2.3   Summary of the Detailed Review of the Theoretical Literature

Table 1 on page 33 presents a summary of the theoretical literature that has been reviewed. Because of the significant amount of overlap between Flamholtz (1983) and Flamholtz, Das, and Tsui (1985), only a single entry in the table has been included for this paper. A number of observations may be made based on the review of the four theoretical models which has been presented.

While, at the most general level, the basic notion of contingency is recognized in each of the models, a number of differences exist between them. The first notable difference is the focal system. While Gordon and Miller (1976) and Waterhouse and Tiessen (1978) focus on the management accounting system itself, Otley

Table 1.   Summary of the Theoretical Literature

Paper	Focal System/Variables	Contingent Variables	Effectiveness Considered	Focal System with Contingent Variables	Papers Crossreferenced
Gordon & Miller (1976)	Accounting information system characteristics	Environment Organization Decision-making style	No	-AIS effected by environment -AIS indirectly effected by environment through organization -AIS effects organization -AIS effects decision-making style	None
Waterhouse & Tiessen (1978)	Management accounting system -planning and resource allocation -performance measurement	Technology -routineness Environment -predictability Organization structure -centralization of decision-making authority	No	-Organization structure is contingent on technology and environment -MAS is contingent on organization structure	None
Otley (1980)	Organizational control package -AIS design -Other AIS design -Organizational design -Other control arrangements	Variables that cannot be influenced by organization -Environment -Technology Organizational objectives	Yes	-Determine the organizational control package selected -Within the package all components are individually and collectively interdependent	Gordon & Miller Waterhouse & Tiessen
Flamholtz (1983) Flamholtz, Das & Tsui (1985)	Core control system processes -planning -operations -measurement -evaluation/reward	Organizational structure Organizational culture Environment	Yes	-Organization structure, organization culture, and environment form a control system context which constrains the core control system	None

(1980) and Flamholtz (1983) take a broader view and focus on an organizational control system which includes the management accounting system.

The second difference which may be observed is the relationship between the management accounting system and organizational structure. While Gordon and Miller (1976), Waterhouse and Tiessen (1978), and Flamholtz (1983) all represent organizational structure as a contingent variable for the management accounting system, Otley (1980) includes the management accounting system as an interdependent component of a larger organizational control package. A third difference is that the two earlier models did not explicitly recognize organizational effectiveness, while the later two models made this variable more prominent.

The final, and perhaps most striking, is the absence of a developmental process in the models proposed. Even though all of these papers were published in the same journal over a nine year period, Otley (1980) is the only paper to even reference the previously published research work. While Otley did review the earlier models, his model is proposed as a replacement rather than an extension.

To conclude, while a body of theoretical literature which has followed the contingency approach to studying management accounting systems has begun to emerge, this literature must still be viewed skeptically. The models proposed to date seem to have developed in a vacuum, leaving a number of critical issues and differences unresolved.

Chapter 3

Literature Review - Empirical Literature

3.1 *Introduction*

Empirical literature taking the contingency approach has developed parallel to, and somewhat independent of, the theoretical literature. A number of empirical studies have been published which have considered how various aspects and attributes of an organization's management accounting system are contingent upon components within the organization and its environment.

Before reviewing the individual studies themselves it is worthwhile to note that several of the studies reviewed, rather than beginning with a contingency perspective, invoked a contingency perspective to explain their findings. Otley observed the following:

Two main lines of development can be distinguished. On the one hand, there are studies which have not explicitly attempted to use a contingency framework, but where contingent results have emerged either within the study itself or when its results have been interpreted in conjunction with those of comparable work. On the other hand, some studies have begun with a contingency framework in mind and have explicitly attempted to assess the impact of various hypothesized contingent factors, either theoretically or by empirical testing.(1980, p. 414)

Throughout this review of the empirical literature these two types of studies will be distinguished.

The remainder of this chapter will be organized as follows. After a brief introduction, a series of detailed reviews of the empirical literature will be presented. The detailed reviews will be followed by a summary of this literature in a manner similar to the summary of the empirical literature provided at the end of Chapter 2. This chapter will conclude with a grand summary, integrating the developments, findings, and unresolved issues from both the theoretical and empirical literature.

3.2   Detailed Reviews

A number of articles have been selected for detailed review. These articles were identified in the manner described at the beginning of Chapter 2. The articles will be reviewed chronologically by year of publication to highlight the developments in this literature. The review of each article will contain, as appropriate, the motivation for the study, the model, theory, and/or hypotheses

of the study, the results of the empirical test, the contribution, and any relevant criticism of the study.

3.2.1   Khandwalla (1972)

A 1972 *Journal of Accounting Research* by Pradip Khandwalla reports one of the first studies appearing in the accounting literature to challenge the universalistic perspective. The results reported were obtained as a part of a larger study conducted to investigate the influence of a number of environmental factors on the structure of an organization (Khandwalla, 1977).

This study can best be described as one in which contingency explanations were provided to interpret the results obtained, as opposed to forming the basis for some *a priori* set of beliefs. In fact, no motivation or model are presented at the beginning of the report, but rather the methods of the study are detailed after a brief synopsis of the findings.

A sample of ninety-two firms were selected from a list of U.S. manufacturing firms. The author reports that care was taken to insure that the firms were from a variety of industries, in order to insure variability along techno-economic variables, however multi-industry, highly diversified, firms were not included to avoid certain measurement problems (p. 277).

Two categories of variables were measured by the completion of a survey

instrument by the president of each firm (p. 277). The first variable was

competition which was conceptualized as having three dimensions -- price

competition, promotion and distribution (marketing) competition, and product

quality and variety competition. A seven-point Likert-type scale was used in the

measurement of both the intensity of competition along this dimension, as well

as, the importance of this dimension of competition to the firm's profitability.

Individual dimension scores were computed by multiplying the intensity measure

by the importance measure. An overall measure of competition was computed

by averaging the three intensity-importance products.

The second variable measured was usage of controls (pp. 277-278). The usage

of nine different controls was measured with a seven-point scale. A summary

measure for each firm was obtained by averaging responses across all nine

controls.

The validity of the data obtained was examined by correlating the president's

responses with those obtained by a sample of the firm's marketing executives

(importance and intensity of competition) and controllers (extent of control

usage). Positive correlations between the president's responses and those of the

marketing executives and the controllers were obtained and were interpreted as

evidence that the measures used were valid (p. 279).

Product moment correlation coefficients were computed between the variable measures outlined above. A correlation coefficient of .31 (p < .01) between the overall index of control use and the overall competition score was observed (p. 280, Table 1). Positive, statistically significant correlation coefficients between the overall index of control use and both the marketing competition and product competition were also observed, however the correlation coefficient of the overall index and price competition failed to be statistically significant. Five of the correlation coefficients between the individual control items and the overall competition score were positive and significant, whereas the remaining four were positive but not statistically significant. Of the twenty-seven detailed competition -- control correlation coefficients computed eight were significant and positive, seventeen were positive and not significant, and the remaining two were negative but not significant. Of the eight significant positive correlations observed, seven were with the product competition measure.

These results were interpreted to imply that, in general, higher levels of competition demanded increase usage of controls. However, this increase is primarily due to the effect of increased product competition, while little effect was observed in price and distributive competition categories. Several explanations for these differences were advanced, primarily related to attributes of the sample, differences in the effect of competition on the organization itself, including structural effects, and a cost-benefit argument.

The contribution of Khandwalla (1972) is significant, primarily because the paper was one of the first to present evidence of some form of contingent relationship between aspects of an organization's management accounting system, in this case the usage of different types of controls, and its environment, specifically several different forms of competition. This evidence provided a strong challenge to the universalistic perspectives held at that time. It is interesting to note the cautious tone of the paper's first paragraph. Khandwalla begins:

> To most accountants, a management information and control system . . . is an article of faith. This paper is not designed to discredit that faith. Rather its purpose is to outline some of the competitive conditions under which sophisticated management controls are more extensively used and those under which they are less extensively used. (p. 275)

While the contribution of Khandwalla is significant, the paper suffers from a critical weakness. No form of theory, model, or hypotheses are advanced in the paper. Thus, while statistically significant results were observed, the paper provides a poor foundation for the development of a theory-based contingent model of management accounting system design.

3.2.2   Bruns and Waterhouse (1975)

William Bruns and John Waterhouse report a study which examines the relationships between a number of structural variables and the use of budgets by managers in a 1975 *Journal of Accounting Research* article (Bruns and Waterhouse, 1975). Unlike Khandwalla (1972), Bruns and Waterhouse began

with a model which explicitly recognized the contingent nature of the relationships between the variables in the study. The study was motivated by a desire to gain understanding of how budgetary control combines with other methods of control, specifically organizational structure, as organizations seek to respond to their environments (p. 177).

Figure 5 on page 42 includes two figures from Bruns and Waterhouse (1975). The first figure represents the general model which guided the research. The second figure represents the specific variables measured, including the expected direction of the relationships.

Bruns and Waterhouse begin by proposing that two alternative strategies for structure control exist. The first strategy is called "decentralized with structuring" (p. 179). This strategy is expected in organizations, which are large and have a high degree of technological sophistication. The alternative strategy is termed "centralized." This strategy is expected in smaller, less technologically sophisticated, organizations.

In decentralized with structuring organizations decision-making authority is shifted to lower levels within the organization, while at the same time, areas of responsibility and authority are clearly defined (p. 179). In this situation control is expected to be *impersonal*. As a consequence, managers are expected to rely more on financial controls, including budget systems and the budget system is expected to be more complex. Therefore the *quantity* of budget-related behavior
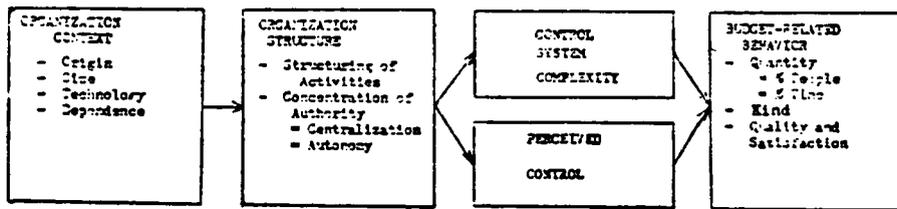
Research domain.
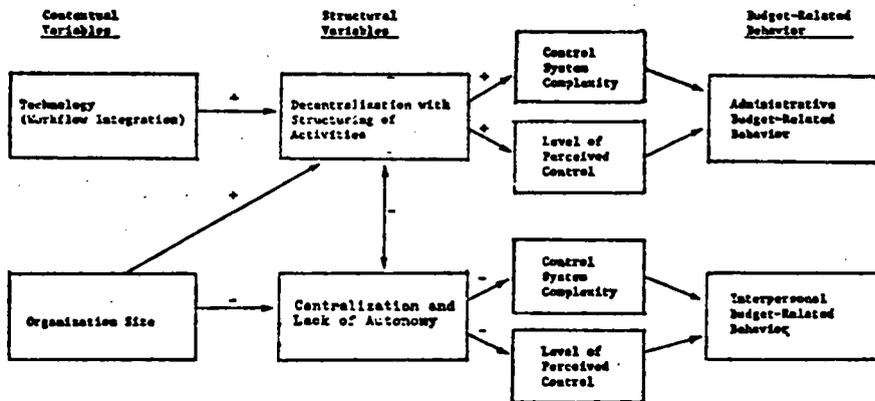
Expected relationships between organization context, structure, and budget-related behavior.

Figure 5.   Bruns and Waterhouse's Model: Source - Bruns and Waterhouse, 1975, p. 181 and 182.

is expected to be high. Furthermore the *quality* and satisfaction of budget-related behavior is expected to be high in this context as well.

Alternatively, in centralized organizations, decision-making authority is retained by higher-level managers and areas of responsibility and authority are less clearly specified (pp. 179-180). In this context the form of control expected is referred to as *interpersonal*. Budget systems are still expected to be used in these situations, however, their use is somewhat different. In centralized organizations budget systems are expected to be less complex and to be perceived more negatively.

Data were collected from a non-random sample of twenty-six organizations. Data collection proceeded in two phases. The first phase entailed a two- to three-hour interview with the organization's CEO or other high-level employee. In addition to explaining the study and gathering some data, this interview included the identification of a sample of employees which would be contacted during the second phase of the study. The second phase consisted of mailing a questionnaire to this sample.

During the interviews, in addition to a number of demographic variables, data was collected on the organization's structure and context and the complexity of its control system. Organization structure and context was measured using scales developed by the Aston Group (Pugh, Hickson, and Turner, 1968; Pugh, Hickson, Hinnings, and Turner, 1969). The contextual variables measured were

size, dependence, and workflow integration. Structuring of activities, lack of autonomy, and centralization were the structural variables measured. The control system complexity measure was developed for this study and included questions about the nature of the responsibility centers in the organization, at what level performance standards are established, and the number of employees involved with budgeting.

The mail questionnaire included two sections. First, a questionnaire originally developed by Fertakis (1967), and subsequently modified by Swieringa and Moncur (1975), was used to measure budget related behavior. Perceived control was measured by Tannenbaum's (1968) control graph questionnaire.

The analysis of the results was broken down into three sections. First, the relationships between organizational context and organizational structure was examined. Product-moment correlations between the contextual and structural measures produced the expected results. Larger organizations tended to be more highly decentralized and have more structuring of activities. These results were interpreted to support the conceptualization of two extreme strategies of control: decentralized and structured, and centralized.

The second section examined the linkages between the structural variables and both control system complexity and perceived control. Again relying on product-moment correlation coefficients, the expected relationships were observed. However, while all of these relationships were in the expected direction,

few were statistically significant. Perceived control was positively associated with structuring of activities ($r = .39$, $p < .05$) and negatively associated with centralization and lack of authority ($r = -.25$ and $r = -.01$, both not significant at $\alpha = .05$). Control system complexity was positively associated with structuring of activities ($r = .04$, not significant) and negatively associated with centralization and lack of authority ($r = -.70$, $r = -.64$, both at $p < .05$).

The final section contains an examination of the link between budget related behaviors and structuring and concentration of authority, perceived control, and control system complexity. Product moment correlation coefficients were computed between the organizational variables and both the descriptive and attitudinal factors for budget related behavior. A total of 140 correlations were computed, eighteen of which were found to be statistically significant at the $p < .10$ or lower level.

After reviewing each of the significant relationships observed, Bruns and Waterhouse conclude that just as organization structures may be dichotomized into decentralized but structured and centralized, budget related behaviors may be dichotomized as well (p. 199). The two structural categories are linked to budgetary control producing two general control strategies. An *administrative control strategy* is proposed to be found in larger more technologically sophisticated organizations. These organizations are decentralized and activities are highly structured. As a result managers within their authority domains have

a perceived high degree of control. In additional these managers spend more time on budgetary activities and, in general, participate actively in the budget process.

Smaller, less technologically complex organizations adopt an *interpersonal control strategy*. These organizations are highly centralized and have relatively simple budgeting systems. Budget-related behaviors revolve around interactions with superiors regarding budget matters, including explanation of variances.

Bruns and Waterhouse (1975) makes a significant contribution to the advance of the contingency approach by being the first study to adopt a contingency framework as the basis for their research. Their model and their results strongly challenge the universal perspective. They conclude:

> Since a portion of budget-related behavior is explained by organizational structure, inferences from studies based on limited samples drawn from organizations of unknown structural properties must be made carefully. Moreover, *universal* policy prescriptions about how budgets should be viewed would be unwise. (p. 197, emphasis added)

However, despite the important contribution made by Bruns and Waterhouse (1975), two criticisms must also be made. First, Bruns and Waterhouse throughout their report propose a dichotomization of control strategy. However, while control strategy is conceived of having two, apparently distinct categories there is no evidence presented in their study to indicate that such a bifurcation is appropriate. Secondly, the budget-related behavior instrument used requires factor analysis before measures are input to subsequent analysis. Bruns and Waterhouse note that their results are different from those obtained in Swieringa

and Moncur (1975) using the same instrument. Thus, the results obtained are not easily compared to other research.

3.2.3 Hayes (1977)

David Hayes reported a study designed to demonstrate how the effectiveness of organizational subunits is contingent on a number of different factors and that these factors vary in importance across different types of subunits (Hayes, 1977). The motivation for the paper was to challenge the use of management accounting measures of performance as being sufficient to adequately assess the performance of different types of subunits in different organizations.

Hayes presents a model of subunit assessment developed to a large extent from Thompson (1967). This model is shown in Figure 6 on page 48. Subunit effectiveness is viewed as resulting from three different aspects. The first aspect concerns subunit interdependence, the second aspect is the type of environment faced by the subunit, and the final aspect is the internal structure and function of the subunit.

The three aspects of subunit performance were further proposed to impact the performance of different types of subunits differentially (p. 24). The performance of production departments was hypothesized to be explained primarily by internal variables and, to a lesser extent, interdependency variables (p. 36). The

Figure · 6.   Hayes' Model: Source - Hayes, 1975, p. 23.
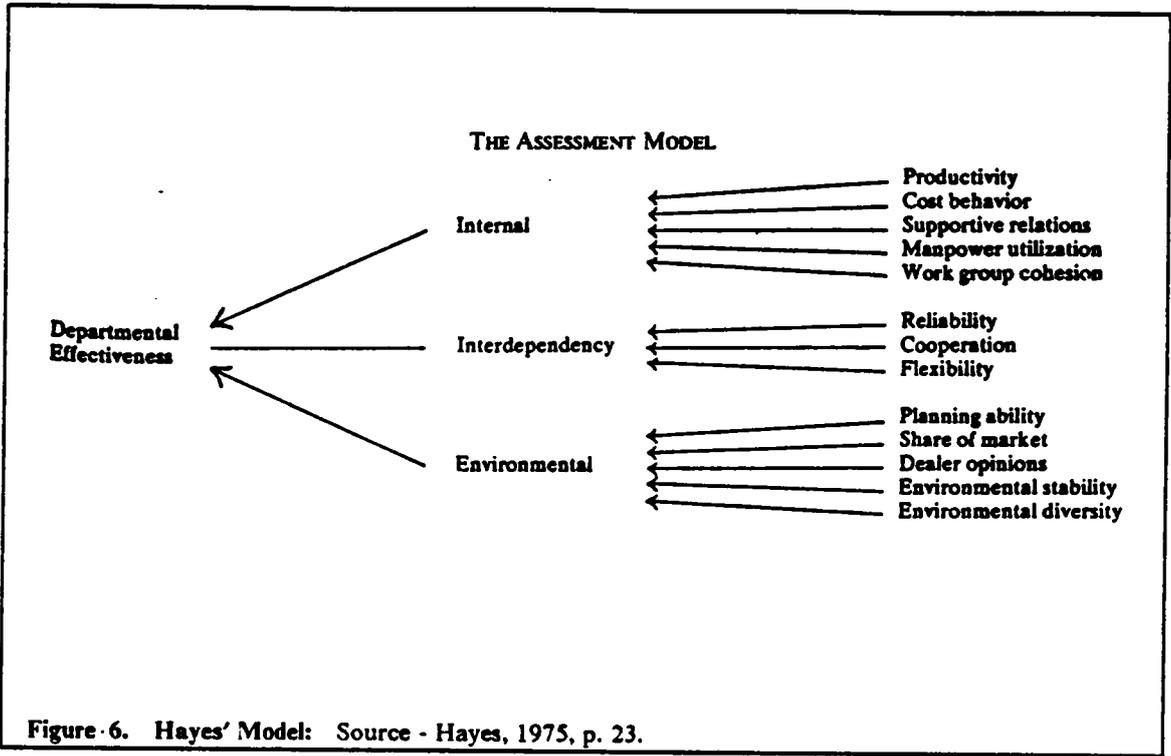
performance of research and development departments were proposed to be primarily explained by interdependency variables alone. Lastly, marketing department performance was expected to be explained in a roughly equal fashion by environmental and interdependency variables.

Data were collected by mailing a set of questionnaires to the marketing, production, and research and development managers in each of 109 larger manufacturing firms in Ohio. Additionally a separate questionnaire was mailed to the controller of each firm. A complete set (all four questionnaires) was received from twenty-four firms.

The questionnaires mailed to the department managers gathered information on their perceptions of the internal and external factors which influenced their department's performance. Also these managers were asked to assess the effectiveness of the other departments in their firm. The controllers were asked to judge the effectiveness of each of the three departments in their organization.

Data analysis began with a factor analysis by department, across organizations of the performance factors. The highest loading questions from each factor were used as independent variables combined with the controller's effectiveness score as the dependent variable in a path analysis model.

The propositions about the relative importance of the three different aspects of performance across the production, marketing, and research and development

departments were generally supported. The major exception to this occurred in the marketing department results. Whereas equal contributions from dependency and environmental variables were expected, it was observed that environmental variables had far greater impact. Hayes interprets the results to imply that managerial accounting measures such as budgets are not satisfactory surrogates for other factors such as environmental and interdependency variables (p. 36). He, therefore, suggests that subunit performance must be assessed using a much broader variety of measurements and that such assessment is contingent on the type of subunit examined.

The primary contribution of Hayes (1977) is that this study is one of the first efforts reported in the accounting literature to examine empirically the role of non-financial variables in the assessment of subunit performance. Additionally, Hayes attempted to base the research on the model previously developed by Thompson (1967).

Tiessen and Waterhouse (1978) and Hayes (1978) record a critical exchange of the study reported in Hayes (1977). Tiessen and Waterhouse criticize Hayes for both poor methodological choices and failure in clearly reporting the research results. Their conclusion is that "this study provides no reliable evidence in support of contingency theory as its applicability to managerial accounting" (Tiessen and Waterhouse, 1978, p. 529). It should be noted that their primary concern was not with the usefulness of contingency theory itself, but rather with the particular methods and reporting presented in Hayes.

3.2.4 Rosenzweig (1981)

Kenneth Rosenzweig conducted a unique study in which several aspects of the controller's department were examined from a contingency perspective (Rosenzweig, 1981). Rosenzweig proposes that little prior research has viewed the controller's department as, yet another, element of organizational structure (p. 339). Therefore, he embarked to document the relationships which exist between this department and other structural elements. The eventual goal was to provide evidence useful for structuring the controllership function in its unique organizational context.

A model relating several dimensions of the controller's department to its context was proposed (pp. 339-342). The context of the controller's department was conceived to include organizational complexity, administrative mechanisms, and overall organizational context. Significant characteristics of the controller's department were its resources, organizational complexity, and report structure.

Data were gathered from on-site interviews with the controllers or CFO's of eighteen small manufacturing companies selected non-randomly from a list of manufacturing firms in the state of Michigan. In total fifty-three questions about the organization were asked in addition to thirty-two questions about the controller's office itself. While many questions were taken from previous studies, a number were developed specifically for this study.

The data were analyzed using product moment correlation coefficients between the organizational variables and the controller's department variables. Additionally, partial correlation coefficients were computed controlling for organizational size.

The results indicated that size was positively correlated with a number of the controller's department variables in all three categories (resources, organizational complexity, and report structure). While, the proportionate size of the controller's department staff and the decentralization of the accounts in the reporting structure were found to be positively correlated with the context, organizational complexity, and other administrative mechanisms of the firms studied; the average seniority of lowest controllership employees were frequently negatively correlated with these variables. An unexpected and surprising result was that unionization was found to be negatively associated with the various aspects of the controller's department.

Rosenzweig (1981) contributes to the contingency approach literature by attempting to address an infrequently studied aspect of management accounting systems - the organization of the controller's department. The study suffers from the most meager theoretical framework. More specifically, no *a priori* specification of the linkages between the characteristics of the controller's department studied and its organizational context and structure is provided. Furthermore, the measures collected are not related to any conceptual scheme so to allow any degree of parsimony in the analysis of results. The combined results

of these weaknesses highlights the admission in the title of the paper of the study's "exploratory" nature.

3.2.5 Merchant (1981; 1984)

Ken Merchant presented reported the results obtained from a larger study which was his dissertation (1978) in two papers (Merchant 1981; 1984). Both reports will be reviewed in this section, however, since the models examined are different in several ways, they will be reviewed separately.

3.2.5.1 *Merchant (1981)*

Merchant (1981) contains an examination of a model which proposed links between budget system variables and both corporate context and organizational performance, manager motivation, and manager attitudes. Furthermore, the study provided a partial replication of Bruns and Waterhouse (1975). The purpose of the study is to test a contingency framework of budget systems focusing on the organizational level of analysis. This perspective is in contrast to many prior studies which have highlighted the individual level of analysis. An additional purpose was to examine whether a proper "fit" between budget systems and their organizational context could be shown to affect organizational performance.

| CORPORATE CONTEXT
—Size
—Diversity
—Degree of decentrali-
zation | → | BUDGETING
Administrative vs.
interpersonal
orientation as
reflected in:
  -Information
—System Supports
—Budgeting Behaviors | → | OUTCOMES
Managerial:
—Motivation
—Attitudes
Organizational:
—Performance |

Figure 7. Merchant's (1981) Model: Source - Merchant, 1981, p. 814.
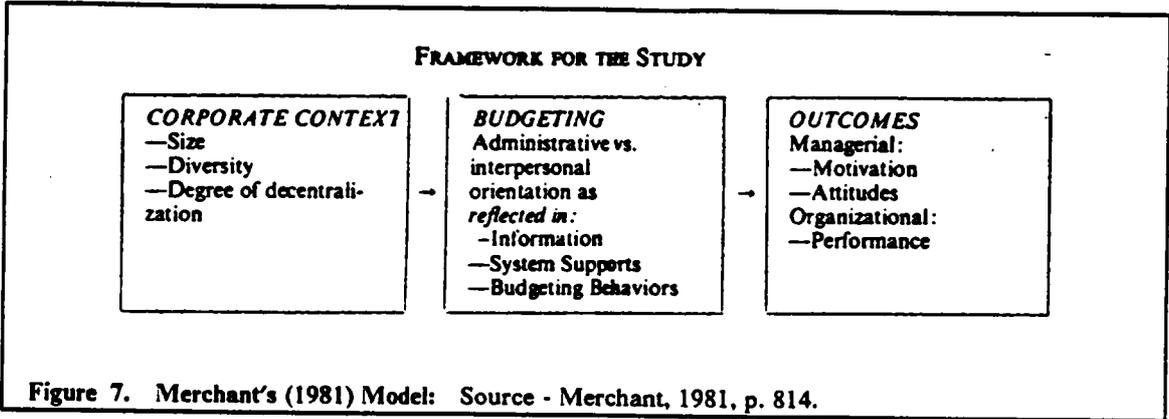
A three-component framework was proposed for the study. This framework is

shown in Figure 7 on page 54. The three major components in the model are

corporate context, budgeting, and outcomes. Corporate context refers to the

"within-corporation environment in which budgeting must operate" (Merchant,

1981, p. 814). This context includes organizational size, diversity, and degree of

decentralization. Larger, more diverse, more decentralized firms are expected to

follow an *administrative control strategy* (Bruns and Waterhouse, 1975) which

has the following characteristics:

1. Greater participation by lower- and middle-level managers in budget-related
   activities.
2. Greater importance placed an achieving budget plans.
3. More formal patterns of communication.
4. Greater budgeting system sophistication.

Smaller, less diverse, more centralized firms are expected to follow an

interpersonal control strategy (Bruns and Waterhouse, 1975) which will have

characteristics opposite of those listed above.

The second link in the Merchant's framework is between budgeting and

outcomes. Outcomes include both the managerial outcomes of attitude and

motivation, as well as the organizational outcome of higher performance. A

proper matching of organizational context and control strategy are expected to

result in favorable attitudinal and motivational effects for managers and in

increased organizational performance.

Data to examine the framework was collected from nineteen organizations in the

electronics industry. Data was collected first through an interview with a senior

corporate official and second through a mailed questionnaire to a sample of middle-level manufacturing managers. A total of 170 managers responded to the questionnaire.

During the interview with the corporate official, data was collected on organizational size, diversification, and decentralization. Additionally information about the corporation's budgeting system including information and system characteristics were collected at this time as well. The middle-level managers were asked to complete the budget-related behavior questionnaire of Swieringa and Moncur (1975) which had also been used by Bruns and Waterhouse (1975). The middle-level managers were also asked to provide motivational and attitudinal data, a self-rated measure of overall performance, and how much time spent on budget-related activities.

Responses to the budget-related behavior questionnaire were factor-analyzed which reduced the original forty-two questions to six factors which accounted for 81.4 percent of the variance. All data, including factor scores, collected from the managers was averaged before being input into the analysis. Finally a total of thirteen measures including the six factor scores, the time spent budgeting, and the six information and system characteristics were combined and categorized into four groups. The groups used were participation, importance of meeting budget, formality of communications, and system sophistication.

Rank-order correlations were computed to test the links proposed between organizational context, budgeting, and outcomes. Of the thirty-nine correlations computed (thirteen budget variables by three corporate variables) eleven were significant at the $p < .10$ level or smaller (p. 822, Table 3). These results were interpreted to support the link between corporate context and budgeting. It should be noted that eight of the eleven significant correlations involved the size measure.

The link between budgeting and motivation and attitudes was partially supported. A total of twenty correlations between the budget variables and the motivation and attitude measures were computed (p. 823, Table 4). Eight significant ($p < .10$ or better) were observed. Only partial support was claimed because no significant association between the system specification measures and the motivation and attitude measure was observed.

The final test was designed to examine whether those firms which fit their budgeting systems to their organizational context had higher performance. Somewhat oblique evidence was obtained by splitting the data into two groups based on size and computing rank-order correlation coefficients between the thirteen budgeting measures and the self-rated performance measure. Of the thirteen pairs of correlation coefficients, seven were higher by .30 or more for the larger firms (p. 824, Table 5). This result, in conjunction with a sign-test on the differences was construed to provide some support for the contingency framework.

Merchant's (1981) findings contribute in several important ways to the contingency approach literature. First, this study represents the first, even partial, replication. The similarity of the results with those observed by Bruns and Waterhouse is encouraging. Second, this study presented the first evidence, however weak, that a proper fit between managerial accounting systems and their context can be shown to be related to higher performance.

Merchant's framework and interpretation suffer from the same weakness identified in reviewing Bruns and Waterhouse (1975). Specifically, while the model describes two archetype control strategies, no evidence of any clustering in the data was presented. This leaves the question unresolved as to whether the administrative/interpersonal strategies are points on a continuum or unique styles. A second significant criticism is that the framework itself fails to provide a simple and yet rigorous model of the contingent relationships between budgets and their organizational context. Perhaps this explains Merchant's choice of the term framework rather than model or theory.

3.2.5.2 Merchant (1984)

Merchant adopts a department-level perspective in his second report (Merchant, 1984). Again a three-component framework is proposed. This framework is displayed in Figure 8 on page 59. The framework identifies three situational characteristics, production technology, market factors, and organizational

SITUATIONAL
CHARACTERISTICS

Production technology
Market factors
Organizational
    characteristics

BUDGETING
SYSTEM
CHARACTERISTICS

ORGANIZATIONAL
PERFORMANCE

Framework for the study.

Figure 8.   Merchant's (1984) Model: Source - Merchant, 1984, p. 292.
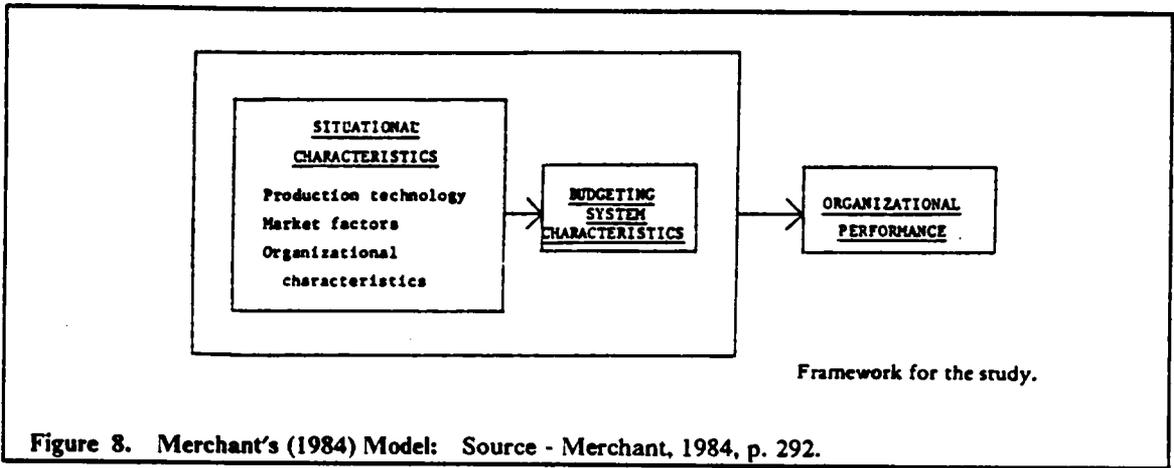
characteristics, which were believed to influence the characteristics of a department's budget system. Additionally, the framework includes a link between the fit of the budgeting system characteristics and the situational characteristics.

The data was collected from the sample described in the review of Merchant (1981), however several new measures were included in this paper. Production technology was conceptualized to fall on a routine/non-routine continuum and was measured by the degree of automation of the production process and the degree of product standardization. Market factors were measured by the stage in the product life cycle and the strength of the marketing position. Size and functional differentiation were the organizational characteristics used in this report. As in Merchant (1981) the factor analyzed results from Swieringa and Moncur's (1975) questionnaire were used, in addition to the amount of time spent in budget related activities, the directness of the link between the corporate reward system and the budgeting system, and the self-reported overall performance.

The linkages between production technology, market factors, and organizational characteristics were examined by observing the correlation coefficients between the various measures of these variables and the eight budget variables. Support for the production technology (p. 300, Table 5) and organizational characteristics (p. 302, Table 7) links were found, however, the results failed to support the link between the market factors (p. 301, Table 6), stage in product life cycle, and

strength of market position. An explanation of the failure to find significant results was that since only manufacturing managers were used, their operations could be buffered from external market forces.

The hypothesized relationship between the fit of budgeting to its departmental context and departmental performance was examined in two ways. First, the data was split at median department size and the correlation coefficients between the budgeting variables and performance was computed for each group. If the fit hypothesis were true, it was expected that larger departments would have systematically higher correlations. This was true for seven of the eight variables with four of the differences being statistically significant (z-test, $p < .10$ or less) (p. 303, Table 8).

A second test of the fit-performance hypothesis was to take each of the six measures used to assess the organizational context, split the data at their median score and compute two sets of correlation coefficients with the performance measure. While statistically significant differences in correlation coefficients were observed for at least one budget variable for both automation of production process and functional differentiation, no significant differences were observed for product standardization, stage of product life cycle, and strength of market position (p. 304, Table 9). Overall these results were interpreted to provide weak, but encouraging, support for the impact of fitting a budget system to its organizational context.

While Merchant (1984) studied budgeting at a department-level phenomena and Merchant (1981) studied it as an organizational-level phenomena, these studies are highly similar in other respects. In fact, both the contributions and criticisms of Merchant (1981) may apply to Merchant (1984) equally well. Namely, these studies are significant both as replications of Bruns and Waterhouse's (1975) work and as extensions by explicitly considering and testing the effect of fit on performance. However, these contributions are mitigated to a certain degree by the poorly articulated frameworks used in these studies.

3.2.6 Gordon and Narayanan (1984)

Lawrence Gordon and V.K. Narayanan designed a study to investigate the relationship between three variables often included in contingency approach accounting studies: perceived environmental uncertainty, organizational structure, and perceived importance of certain information characteristics. This study is not a test of any explicit contingency theory or framework, nor is it a direct test of some set of characteristics directly attributable to a particular management accounting system. However, because the research addresses several relationships and issues which are often assumed in contingency approach studies of management accounting systems it will be included in this review.

Gordon and Narayanan review a large number of theoretical and empirical studies in both the organizational theory and accounting literature. This review

leads to several general findings. First, the organization theory literature

supports the assertion that the structure adopted by an organization is influenced

by its environment (p. 34). More precisely, *mechanistic* forms of organization are

often associated with stable environments and *organic* forms of organization are

associated with unstable environments. Furthermore, *perceived* environmental

uncertainty seems to be a better predictor of structure than any objective

measure.

A second finding from the accounting literature is that an information system is

contingent on its particular organizational context (p. 35). This context includes

both the organization's environment and its structure. These findings, when

considered together, raise an important, yet unanswered, question. What is the

relationship between organizational structure and information systems? Several

theoretical works had proposed that both structure and information systems are

a part of some collection of strategies that were interdependent and selected

together by the organization in response to its environment. Alternatively, other

theoretical work and virtually all empirical work viewed structure as preceding,

or logically prior to, information systems. While no formal model or theory was

advanced to support their beliefs, hypotheses were advanced which related

structure to environment, certain characteristics of information to environment,

and certain characteristics of information to structure.

Data was gathered from thirty-four senior level managers in medium-size,

Midwestern firms using structured interviews. Perceived environmental

uncertainty and organization structure were measured using questions adapted from Khandwalla (1977). The perceived importance of three characteristics of information: external, non-financial, and ex ante, each of which is not traditionally characteristic of an organization's information system, were measured using questions developed for this study.

The results were analyzed in two phases. First, zero-order (simple) Pearson correlation coefficients were computed between each information characteristic, perceived environmental uncertainty, and the structure measure. All nine coefficients were statistically significant at the $p < .05$ or higher level (p. 41, Figure 1, part A). Second, first-order (partial) correlation coefficients were computed among the three sets of variables. This procedure yielded a most interesting result. While in all three cases the partial correlation coefficients between perceived environmental uncertainty and both structure and the information characteristic remained statistically significant, each of the three partial correlation coefficients between the structure and information characteristic variables failed to be statistically significant (p. 41, Figure 1, part B).

These results were interpreted to mean that while both organization structure and the information characteristics were associated with perceived environmental uncertainty and with each other, that the relationship between structure and information characteristics is spurious and results only from the common influence of perceived environmental uncertainty. This implication lead the

authors to conclude that both structure and information system design should be viewed as part of an overall package of strategies to respond to environmental uncertainty rather than the view expressed in some earlier contingency work which placed structure logically prior to information system design (p. 42).

Gordon and Narayanan (1984) expose a potentially significant weakness in a great deal of prior empirical research performed to examine contingency issues. Prior research has often relied extensively on bivariate relationships. However, the complexity of interactions in organizational phenomena requires more complex models and analytical strategies. Research failing to rely on more complex strategies runs the risk of falling prey to the three-variable problem.[4]

The approach used by Gordon and Narayanan to address the significant issue of the precedence of structure over information system characteristics limits the significance of their findings. The characteristics of information used in the study, i.e., external, non-financial, and ex ante, are, as indicated by the authors, are **not** a part of the information system of most organizations. Therefore in responding to the questions the managers were indicating their perceived importance to a *non-existent or hypothetical information system*. While this fact does not eliminate the interesting findings of the study, it does require a careful interpretation of the study's results and their implications.

---

[4] The three-variable problem refers to the situation in which two variables are observed to be correlated, but upon closer inspection this correlation is demonstrated to be caused by a third, unobserved variable.

3.2.7 Rockness and Shields (1984)

Howard Rockness and Mike Shields criticize previous research studying the contingent nature of organizational control for using a too narrow definition of control and for primarily focusing on production settings in their 1984 study (Rockness and Shields, 1984). They seek to improve on this previous work by expanding the conceptualization of control and examine a non-production setting.

Ouchi's organizational control framework (Ouchi, 1977) is used by Rockness and Shields to provide an expanded view of organizational control. Ouchi's framework begins with task characteristics. The two primary task considerations are the knowledge of the transformation process and the measurability of the outputs. The second component of the framework are the possible choices of organizational controls which include social, behavior, and output controls. Rockness and Shields redefine Ouchi's original specification of social control as a specific type of a general class of input controls. Figure 9 on page 67 displays the resultant set of controls and their expected use relative to the primary task characteristics. Two secondary task characteristics are cited - task complexity and task interdependence. These characteristics are associated with output control. From the framework present six substantive hypotheses are proposed which relate the various types of control to both the primary and secondary task characteristics.

Knowledge of
Transformation Process

	Low	High
Low	Input	Behavior
High	Output	Output or Behavior

Timely Measurability
of Output
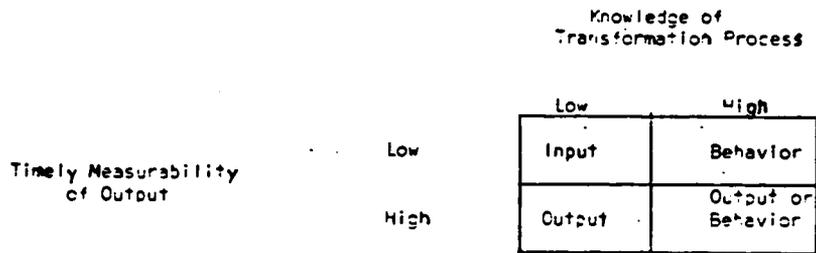
Organizational Controls	Organizational Controls for R/D
Input	Social; Expenditure Budget
Behavior	Formal Rules and Operating Procedures; Technical Scheduling Methods
Output	Market.

Modified Ouchi organizational control framework.

Figure 9.   Rockness and Shield's Model: Source - Rockness and Shields, 1984, p. 168.

Seventy-six first-line research and development supervisors drawn from ten different organizations completed a questionnaire to provide the data used in the study. The perceived importance of input, behavior, and output controls in each of four management functions was measured using an instrument developed for this study. The four management functions were planning, monitoring, evaluating, and rewarding. The primary task characteristics of knowledge of the transformation process and the timely measurement of the output were measured with two questions each, whereas a single question was used to measure each of the secondary task characteristics: task complexity and task dependency. The age, size, vertical differentiation, and type of research and development work performed by the group, representing organization context and structure variables, were also measured.

The six hypotheses were tested by using partial correlation coefficients (both bivariate Pearson and Kendall's Tau correlations were computed). Partial correlation was used to control for the four organizational context and structure variables. A total of sixteen partial correlation coefficients were used to test the six hypotheses. Only seven of the sixteen coefficients were both significant ($p \leq$ .10 was used) and had the predicted sign (p. 173, Table 3). Whereas three hypotheses had four different coefficients used in their test, one hypotheses had two coefficients, and the remaining two had only one coefficient. Two of the six hypotheses were confirmed, two had mixed results, and two were rejected.

The results were interpreted to provide only limited support to Ouchi's framework (p. 175). The strongest support provided was for an association between controls and knowledge of the transformation process. Little support for any association between controls and the measurability of output, task dependence, or task complexity was found. Rockness and Shields questioned whether some of the measurements which they had selected limited the findings.

Rockness and Shields contribute to the contingency literature by attempting to expand beyond the normal definitions and by attempting to incorporate Ouchi's organization control framework. The lack of expected results, however, severely limits the contribution of their research.

3.2.8 Govindarajan (1984) and Govindarajan and Gupta (1985)

V. Govindarajan and A. Gupta worked together to study contingent relationships between performance evaluation systems and other variables. Their results were reported in Govindarajan (1984) and Govindarajan and Gupta (1985). Because these two studies address somewhat the same issues, use some of the same measures, and rely on the same sample they will be reviewed together.

3.2.8.1 Govindarajan (1984)

Degree of reliance on subjective (non-formula)
approach in performance evaluation

		Low	High
		Incongruence	**Congruence**
High		Lower organizational performance	Higher organizational performance
		Congruence	**Incongruence**
Low		Higher organizational performance	Lower organizational performance

Environmental
uncertainty

Figure 10.   Govindarajan's Model: Source - Govindarajan, 1984, p. 128.

Govindarajan (1984) reports a study designed to investigate environmental uncertainty as an important intervening variable in the use of objective measures such as budget amounts in performance evaluation. The paper is positioned as an attempt to expand the understanding of how budgets are used by highlighting the impact of uncertainty in the organization's environment.

The framework is a 2 x 2 matrix representing the relationship between environmental uncertainty and the degree of reliance on a subjective approach in performance evaluation. This matrix is shown in Figure 10 on page 70. A match between these variables is obtained when either both are low or both are high. In these cases higher organizational performance is expected. Lower organizational performance is expected when no match is obtained.

The framework was examined by collecting data from fifty-eight business unit managers sampled from eight *Fortune 500* companies. Environmental uncertainty was measured using an instrument which appears in Miles and Snow (1978). The degree of reliance on formula versus subjective approaches to performance evaluation was measured by asking what portion of the business unit managers bonus was decided in a subjective manner. A self-rated measure of performance was developed for the study.

Three statistical tests were performed to examine the performance evaluation - environment uncertainty model. First, a Pearson product-moment correlation coefficient was computed between the percentage of bonus determined

subjectively and unit effectiveness. This coefficient was not significantly different from zero (r = 0.11, p < .05). Thus no direct relationship between these variables was observed and no prima facie evidence of the superiority of a particular performance evaluation method was found. Second, the correlation between environmental uncertainty and performance evaluation style was examined. A statistically significant positive association between these variables was observed (r = 0.43, p < 0.001). This implies that those business unit managers which face higher levels of environmental uncertainty tend to have higher portions of their bonus determined subjectively.

A third and final test examined the interactive effect of environmental uncertainty and performance evaluation style on performance. This relationship was examined by splitting the data into two groups - high and low effectiveness. When the correlation between environmental uncertainty and performance style was recomputed the high effectiveness group had a strong positive coefficient (r = .59, p < .001) whereas the low effectiveness group's coefficient was not significantly different from zero (r = 0.19, not significant). These results indicate that how accounting data including budgets are *used* is, in part, a function of environmental uncertainty. Also, differences in use had implications on the effectiveness of the organization.

The contingent relationships studied in Govindarajan (1984) differ from previous work in at least two ways. First, the study focused on the effects environmental uncertainty, a variable missing in several previous studies. Second, the study

focused on the use of accounting data, whereas many previous studies highlighted attitudes towards budgets and budget system characteristics. Both of these foci, when taken together, resulted in a significant study.

Few weaknesses can be found in the study itself. The major weakness observed is the study's failure to consider the additional contingent variables such as organizational structure and technology.

3.2.8.2   *Govindarajan and Gupta (1985)*

Govindarajan and Gupta (1985) continues with the theme began in Govindarajan (1984). This study, rather than addressing the impact of environmental uncertainty on performance evaluation style, examines the implications of business unit strategy. Strategy has often been cited in the organization theory literature as a potential contingent variable, however this variable has appeared in only one previously published accounting study (Merchant, 1984).

A theoretical background is presented and several propositions are advanced on the relationships between business unit strategy, performance evaluation style, and unit effectiveness. Business unit strategy has a variety of dimensions, however, the trade-off between growth in market share and short-term earnings (cash flow maximization, termed strategic mission, is selected for this study. A continuum between strictly a *build* strategy in which growth in market share is

the dominant goal and a *harvest* strategy in which cash flow/earnings maximization is the dominant goal. Units following a build strategy would be expected to rely on long-run criteria in the determination of bonuses, whereas units following a harvest strategy are expected to emphasize short-run criteria. Because short-run criteria are often easier to measure than long-run criteria, units following a build strategy will be expected to place greater reliance on subjective criteria in determining bonuses. In each case, failure to match performance evaluation style to strategy will result in lower effectiveness.

Data was collected from the same sample identified in Govindarajan (1984). Also, the same measures for business and effectiveness and reliance on subjective approaches in determining bonus were used in the present study. Business unit strategy was measured using an instrument developed for the study. This instrument placed each unit in a range from -1 to +1 depending on whether the unit was following a build strategy or a harvest strategy. A portion of the instrument which was used to measure unit effectiveness was used to measure the degree of importance placed on several specific performance criteria and provide a measure of the importance of both long-run and short-run criteria.

A multiple-equation regression model was used to test for the expected relationships. The results confirm that managers in effective business units place more emphasis on long-run criteria when the unit follows a build strategy. The data did not, however, support the proposition that effective business units placed more emphasis on short-run criteria when they were following a harvest strategy.

The authors note that short-run criteria seemed to be significant, regardless of the strategy being followed (p. 60).

The proposed relationship between business strategy, reliance on subjective approaches and unit effectiveness was supported by the results. Specifically, effective units, following a build strategy, placed greater reliance on subjective approaches to determining incentive bonuses; whereas effective units, following a harvest strategy, emphasize less-subjective (formula-based) approaches in computing incentive bonuses. These results were also supported by plotting the partial derivatives of the regression equations and examining theses for monotoncity.

The contribution of Govindarajan and Gupta (1985) is similar to that of Govindarajan (1984). An additional contingent variable, in this case business unit strategy, was shown to be related to performance evaluation. Furthermore, this study demonstrated the critical link between proper fit on unit effectiveness. However, because of the failure to clearly articulate the theoretical formulation which undergirded both studies and because the authors did not discuss the connections between their theory and results with those of prior research the significance contribution of these studies is reduced.

3.2.9 Chenhall and Morris (1986)

The most recent major empirical contribution employing the contingent approach to management accounting systems research was performed by Robert Chenhall and Deigan Morris. These authors criticize previous research failing to provide empirical tests of proposed models, and in the case where empirical examinations were performed for relying on overly simple, zero-order correlation analysis.

A model of management accounting system design, focusing on the direct and indirect relationships between environmental uncertainty, organizational interdependence, decentralization of organizational structure and the usefulness of four information characteristics of a management accounting system. The model is displayed in Figure 11 on page 77. The four information characteristics examined are the scope, timeliness, aggregation, and integration of the management accounting system information.

A total of six hypotheses were proposed indicating both the direct and indirect effects of the independent variables, environmental uncertainty, organizational interdependence, and decentralization, on the dependent variable, the perceived usefulness of the information characteristics. For example, a direct relationship between each of the three independent variables and the scope of management accounting system information was predicted. As an example of indirect effects, an indirect relationship was hypothesized between both the scope and integration

A CONTINGENCY MODEL OF PERCEIVED USEFULNESS OF MAS

External Environmental Uncertainty

Organizational Structure: Decentralization

Organizational Interdependence

Perceived Usefulness of MAS: 1. Scope 2. Timeliness 3. Aggregation 4. Integration.

Figure 11. Chenhall and Morris' Model: Source - Chenhall and Morris, 1986, p. 17.
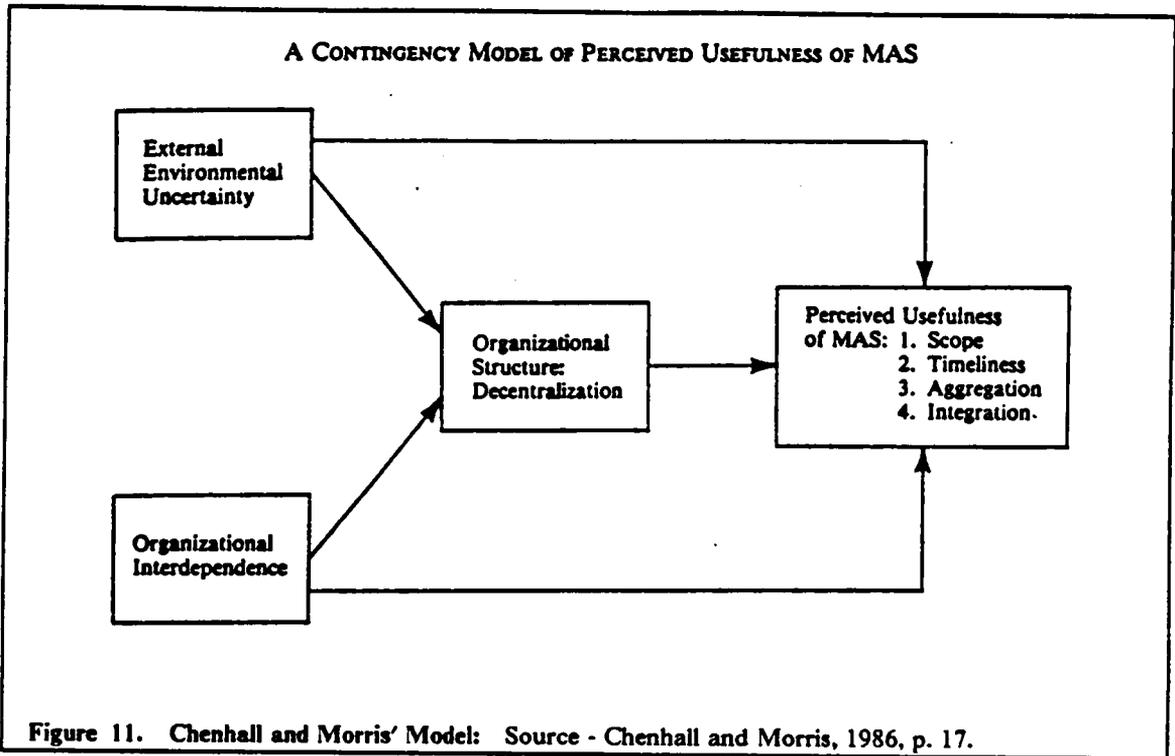
information characteristics and organizational interdependence *acting through decentralization.*

A total of eighty-six middle- to upper-level managers from thirty-six different Australian manufacturing organizations participated in the study by responding to a structured questionnaire administered in an interview format. The instruments used to measure both decentralization and organizational interdependence were originally developed by the Aston group. The perceived environmental uncertainty measure was originally developed by Duncan (1972) and later modified by Sathe (1974). The dependent variable measurements were taken from the average response for each category of information characteristic. These *a priori* groups were confirmed by a factor analysis of the responses. The dependent variable measurements for the information characteristics which were used resulted from a factor analysis of twenty-four items which each described some attribute or type of information. Managers responded using a Likert-type scale indicating the degree of usefulness of each item. Factor analysis was used to confirm the construct validity of the theoretical groupings, however subsequent analysis was based on averages of the responses rather than factor scores.

Path analysis was used to examine each of the six hypotheses. A total of four path models were estimated, one for each information characteristic, and the statistical significance of the path coefficients was examined to confirm or disconfirm the prior beliefs. Because of the large number of hypotheses it is difficult to summarize the results in a simple fashion. With respect to the

hypothesized direct effects, a total of eight significant direct effects were predicted. The results confirmed six of the eight hypothesized direct effects, and one direct effect which was not expected to be significant did prove to be so. While a total of four indirect effects had been predicted, only two proved to be statistically significant. One unexpected indirect effect, that of organizational interdependence acting through decentralization on aggregation was also observed. These results were interpreted, as a whole, to provide support for the model.

Several of contributions of Chenhall and Morris (1986) should be noted. First, the study recognized and addressed the fact that the simple models used in previous research were not sufficient to provide deeper insight into management accounting system design. By considering both direct and indirect effects the study moves the literature forward towards consideration of more complex relationships. Second, the study considered the impact of structural responses, in this case decentralization, to uncertainty on management accounting system design. It therefore provides additional insight into environment-organizational structure-management accounting system interrelationships.

The two primary weaknesses observed in the study are, first, the failure of the authors to develop or refer to a framework which explains the relationships expected as a whole. Instead, support is offered in a piecemeal fashion for each individual relationship. Second, similar to the study by Gordon and Narayanan (1984), the authors focus on the perceived usefulness of information

characteristics rather than the perceived usefulness of some particular system. Since no evidence is provided that the responding managers work regularly with the type of information described, there is no clear basis for their perceptions. In fact, as the authors indicate, traditional management accounting systems often do not include information with the characteristics described.

3.3   Summary of the Detailed Review of the Empirical Literature

The diverse nature of the empirical contingency literature precludes a simple summary. Many of the similarities which may be observed at a high level of abstraction disappear upon closer examination. Table 2 on page 81 contains a summary of the eleven studies reviewed.

At a general level the following comments may be made. First, from a variety of perspectives, focusing on a variety of variables, the contingency approach is supported by the empirical studies which have been reported to date. Consistently the empirical findings have challenged and defeated the universal perspective. Thus there would be no basis for studies which proposed some universal managerial accounting system irrespective of organizational context.

Table 2. Summary of the Empirical Literature

Paper	MAS Variables Measured	Other Variables Examined	Effectiveness Considered	Results
Rhode (1972)	Usage of control	Competition	No	-High levels of product competition related to high usage of controls -No relationship between price and distributive competition and usage of controls
Bruns & Waterhouse (1975)	Budget-related behavior, Perceived control, Control system complexity	Organization structure	No	-Large and technologically sophisticated organizations employ decentralized with structuring form and adopt an administrative strategy -Smaller, less technologically sophisticated organizations employ centralized structures and adopt an interpersonal control strategy
Hayes (1977)	Subunit effectiveness	Subunit interdependence, Subunit environment, Subunit internal structure	Yes, as dependent variable	-Subunit effectiveness is explained by different variables depending on the type of subunit (production, marketing, R&D) -Many non-financial variables are important to explain subunit effectiveness
Rosenzweig (1981)	Controller's department -resources -interdepartmental complexity -report structure	Organizational complexity, Administrative mechanisms, Organizational context	No	-Many aspects of the controller's department are associated with its organizational context
Merchant (1981)	Organizational budget system characteristics, Budget participation, Importance of meeting budget, Formality of communication, Budget system sophistication	Organizational size, Diversification, Decentralization, Motivation and attitudes	Yes	-Budget system variables were found to be associated with corporate context variables -Real link between budget system variables and manager motivation and attitudes -Real support that a proper matching of budget system with corporate context is related to higher performance
Merchant (1984)	Departmental budget system characteristics	Production technology, Market factors, Organizational characteristics	Yes	-Departmental budget system characteristics were associated with production technology and organizational characteristics, but not with market factors -Moderate support for the effect of a fit between the budget system and its context on performance was observed
Gordon & Narayanan (1984)	Perceived importance of information characteristics	Environmental uncertainty, Organizational structure	No	-While both organization structure and the perceived importance of information characteristics were associated with both perceived environmental uncertainty and each other, they were not related to each other when the effect of perceived environmental uncertainty was controlled for
Rockness & Shields (1984)	Importance of input, behavior and output controls	Knowledge of the transformation process, Timeliness of output measures	No	-The results did not generally support the expectation -The strongest support was found for the association of the importance of controls and the knowledge of the transformation process
Govindarajan (1984)	Performance evaluation style	Environmental uncertainty	Yes	-The higher the level of environmental uncertainty, the higher the reliance on subjective approaches to performance evaluation -Proper environment-evaluation style matching was related to higher performance
Govindarajan & Gupta (1985)	Performance evaluation style, Importance of long-run vs. short-run performance criteria	Business unit strategy	Yes	-Business units following a build strategy emphasize long-run criteria more than those following a harvest strategy -Short-run criteria are emphasized regardless of strategy -Effective business units properly match performance evaluation style to business unit strategy
Chenhall & Morris (1986)	Usefulness of information characteristics	Environmental uncertainty, Organizational interdependence, Organizational structure	No	-Various usefulness of information characteristics were found to be both directly related to environmental uncertainty and to organizational interdependence and indirectly related through decentralization and

Indeed every study reviewed provided some support for the contingency approach.

A second observation is that when attention has been given to the fit between management accounting variables and other contextual variables and organizational effectiveness, consistent, albeit weak, support has been observed. Therefore, additional consideration of the relationship between a management accounting system and its organizational context seem to be warranted at a practical level.

Beyond these broad generalizations, a number of weaknesses and criticisms of the empirical literature may be observed. The first major weakness has been the general absence of a strong theoretical base for the empirical studies reported to date. Specifically, while several studies appeared to have no *a priori* at all (Khandwalla, 1972; Rosenzweig, 1981); still others drew from a broad variety of theories primarily taken from the organization theory literature in such a piecemeal fashion (Merchant, 1981, 1984; Govindarajan, 1984). Still other studies attempted to use a specific organizational theory but were criticized in the operationalization of those theories (Hayes, 1975; Rockness and Shields, 1984). Lastly it may be noted that none of the empirical studies reported to date have been based on theoretical models proposed in the accounting literature.

A second criticism relates to the models or frameworks which have been used in the majority of the empirical studies. With the notable exception of Hayes (1975),

Gordon and Narayanan (1984), and Chenhall and Morris (1986), the models have addressed only simple, bivariate relationships. It is unlikely that such models are sufficiently complex to reflect the richness of the underlying phenomena.

A related criticism of the extant empirical literature pertains to the lack of attention given to the critical linkage between the fit of the management accounting system to its context and the effectiveness of the organization. Without demonstrating that this fit is related to higher levels of effectiveness little practical significance may be attributed to any associations observed.

3.4 Summary of the Literature Review

Both the theoretical and the empirical management accounting system literature following a contingency approach have been reviewed. This review has exposed encouraging results from the research reported to date and has revealed many weaknesses and potentials for future research. Several summary comments are provided to conclude the literature review.

From the literature reviewed, the contingency approach has replaced the universal perspective as the dominant viewpoint of management accounting systems research. On both theoretical and empirical fronts this dominance has been observed. In fact so overwhelming is this dominance that universal

prescriptions now seem quaint. For example, statements like "Participation in the budget process always leads to higher performance and satisfaction," result in almost reflex-like challenges.

However, the superiority of the contingency approach over the universal perspective should not be mistaken for the strength and completeness of this viewpoint. To date the theoretical formulations following this approach are best considered as partial, preliminary attempts to describe and predict this phenomena. Furthermore the empirical results obtained, while encouraging, must be viewed as tentative, exploratory work.

The dominance of the contingency approach, coupled with its still embryonic state gives rise to two *requirements* for future research. First, future research must be based on a sound theoretical foundation. This theory must be well articulated and sufficiently complex to support continued development of the contingency approach. Second, further theoretical development, must be accompanied by empirical support including evidence relating the fit of a management accounting system to its organizational context and organizational effectiveness. The research reported in this dissertation will attempt to meet both these requirements.

Chapter 4

Model Development

4.1 Introduction

From the review of the literature it has been shown that additional empirical research, built on a solid theoretical foundation, is necessary for the more complete exploitation of the contingency approach to management accounting system design and use. The purpose of this chapter is to develop a theoretical model of budget system usefulness. This model will be based on a theory of organizational structure proposed by Galbraith (1973). Before the model itself is presented, a brief discussion of the reasons for choosing Galbraith's theory will be presented.

4.2 Rationale for Choosing Galbraith's Model

There are four primary reasons why Galbraith's model was chosen as a basis for the research presented in this dissertation. They are:

1. Weaknesses in previously developed theories in the accounting literature.
2. Limitations of other organizational theories for accounting research.
3. Recommendations for Galbraith's model in the accounting literature.
4. Strengths of Galbraith's model itself.

Each of these reasons will be explained in detail.

A review of the theoretical literature which has adopted a contingency approach to management accounting system design and use was included in Chapter 2. As may be recalled, this review indicated that the extant theories proposed each suffer from one or more critical flaws which limit their potential as a base for future research. For example, Gordon and Miller (1976) proposed a model for accounting information system design which attempted to unify concepts drawn from the organization theory, business policy, and decision style literatures. Given this ambitious goal it is not surprising that the resultant model is unclear on a number of critical issues. Therefore, given the weaknesses of the theories proposed to date in the accounting literature, a decision was made to examine the supportive field of organization theory.

Just as has been observed in the accounting literature, there are number of competitor theories in the organizational literature. Starting with the early work

of Burns and Stalker (1961), Woodward (1965), and Lawrence and Lorsch (1967) and continuing to current defense of contingency theory by Donaldson (1985), an extremely large literature has developed. However, while many theories of organizational structure have been proposed following a contingency approach, many of these theories do not provide a suitable basis for accounting research. For example, Hayes (1977) attempted to use Thompson's (1967) theory. After admitting himself that Thompson's work was "conceptually abstract" (Hayes, 1977, p. 23), Hayes was criticized by Tiessen and Waterhouse (1978) for inadequate theoretical justification and specification of the model tested. Similarly Rockness and Shields (1984), after failing to find strong support for Ouchi's (1977) control framework, make the following observation, "Ouchi's framework may be an inadequate representation of the environment in which control systems operate"(p. 175). Therefore, while organization theory provides a large number of potential models which may be used in accounting research, not all of these models are equally well suited for the task.

Sathe (1975, 1978) points towards Galbraith's theory as providing a suitable basis for accounting research. He states: "The work of . . . Galbraith indicates the importance of information processing as the key concept linking the variables considered, and this is a fruitful avenue for further research" (Sathe, 1975, p. 62). And, in another context, "The conceptual work of Galbraith offers an excellent vehicle" (Sathe, 1978, p. 91). In addition Cooper (1981), in a discussion about contingency theory, states: "Galbraith's work also has important implications for management accounting" (p. 185). Furthermore references to Galbraith's work

appear in Rosenzweig (1981), Merchant (1981 and 1984), Gordon and Narayanan (1984), Govindarajan (1984), Govindarajan and Gupta (1985), and Chenhall and Morris (1986).

The final rational for choosing Galbraith's theory is the appropriateness of the theory itself. This assessment is based on the fact that Galbraith's theory is built around the concepts of uncertainty and information processing which provide both clarity and unity to the model. Furthermore, Galbraith's model includes structural responses which include management accounting systems, a critical element notably missing from many other organization theories.

To summarize, Galbraith's theory of organizational structure has been selected from the organizational theory literature. This theory was selected based on both the recommendations found in the accounting literature and on the strength of the theory itself. The remainder of this chapter will provide a description and extension of Galbraith's theory which forms the basis of the model which has been empirically examined.

4.3   Galbraith's Model

In a series of works, Galbraith (1969, 1973, 1977) developed a model of

organizations employing an information processing perspective.[5] The basic model is built on a contingency perspective. Galbraith (p. 2) states that this perspective may be summarized by the following two statements. First, there is no one best way to organize. Second, all ways of organizing are not equally effective. Once these two premises are accepted, Galbraith indicates that a primary research task is the identification and explanation of the contextual factors that are useful in determining the most effective organizational form (p. 2).

Galbraith provides uncertainty as a key concept that may be used to understand these contingent relationships. He defines uncertainty as "the difference between the amount of information required to perform a task and the amount of information possessed" (p. 5). This conceptualization of uncertainty leads to the central concept of information processing. Although Galbraith does not explicitly define information processing, Engelhoff (1982), relying on Galbraith's work, states that information processing is the "gathering of data, the transformation of data into information, and the communication and storage of information in the organization" (Engelhoff, 1982, pp. 435-436).

Galbraith asserts that the critical source of uncertainty arises during the performance of the organizational task (p. 4). Tasks vary in their uncertainty and tasks low in uncertainty could be entirely preplanned. During execution of a preplanned task, there would be no lack of required information or no

---

[5] All subsequent references to Galbraith will refer to the 1973 work, only page numbers rather than the full reference will be included for the sake of brevity.

uncertainty. High uncertainty would be associated with tasks that could not be completely preplanned. As a high uncertainty task is being performed, additional information processing is required.

Galbraith states that a particular task and organization combine to produce a specific level of uncertainty (p. 5). This level of uncertainty in turn determines the organization's information processing requirements. The organizational design task is to structure the organization and its information processing systems in such a manner that their information processing capacities are sufficient to meet these requirements.

Galbraith outlines a total of seven different strategies that may be selected by an organization. The first three strategies are:

1. the specification of rules, programs, and procedures,
2. the formation of managerial hierarchy, and
3. the setting of targets or goals for the organization and its subunits (pp. 10-14).

These three strategies are responses to increasingly higher levels of uncertainty. An organization would first choose to simply pre-specify, through rules, programs, and procedures, all of the behaviors that it desires from its employees. For even moderate levels of uncertainty, however, this strategy cannot be entirely successful. In this event the organization would select members to function as managers, often spanning several organizational subunits.

Given sufficient uncertainty, however, the combination of hierarchy with rules, programs, and procedures, may not be sufficient. Communication lines to the managers could become overloaded as the number of items not covered by the plans and procedures increases. Managerial responses would then be sluggish as their information processing load increases. In this event, the organization may choose to push decision-making authority further down in the hierarchy. As authority is decentralized, however, conflict between subunit efficiency and organizational efficiency may arise. In this situation, the setting of goals and targets can be used (1) to direct the subunit manager's attention toward the outcomes that are desired by top management and (2) to alert the subunit managers to the interdependencies that exist.

The three strategies of rules, programs, and procedures; hierarchy; and target or goal setting form the basic model for a bureaucratic organization. Galbraith suggests four additional strategies when organizations face such high levels of uncertainty that the basic bureaucratic form does not provide sufficient information processing capacity (pp. 14-19). They are:

4. creation of slack resources,
5. creation of self contained tasks,
6. investment in vertical information systems, and
7. creation of lateral relations.

Strategies 4 and 5 may be used to reduce information processing requirements, whereas strategies 6 and 7 increase the information processing capacity of the organization. The particular combination of these four strategies adopted by an organization will depend on their individual costs and benefits.

To summarize, Galbraith proposes a model of organizations as information processing systems. The information processing requirements faced by an organization are a function of the uncertainty associated with its task. Task uncertainty is the difference between the information required to perform the task and the information processed by the organization. Different organizational forms possess different capacities for information processing. The basic bureaucratic organization applies rules, programs, and procedures, hierarchy, and goals and targets to provide sufficient information processing capacity. A collection of additional strategies are provided for organizations which have information processing requirements that exceed the capacity of the basic bureaucratic structure.

4.4 Tushman and Nadler's Extensions and Modifications of Galbraith's Model

Tushman and Nadler (1978) extend and modify Galbraith's model in several ways. First, Tushman and Nadler assume that an organization can be viewed as a collection of subunits. Whereas Galbraith's structural model addresses design issues at the organizational level, Tushman and Nadler choose to focus on the subunit in their analysis.

Second, Tushman and Nadler extend Galbraith's basic notion of task uncertainty by decomposing it into three dimensions. These dimensions are subunit task characteristics, subunit task environment, and inter-unit task interdependence. Subunit task uncertainty and subunit task environment, together, resemble Galbraith's original concept of task uncertainty. Galbraith emphasizes in his discussion of task uncertainty, that uncertainty may arise from both inside outside the organization. For example, Galbraith (p. 14) cites both changes in customer demand and changes in product design in his examples of events which affect task uncertainty. Thus, Tushman and Nadler have simply divided Galbraith's original concept of task uncertainty into two related concepts. Inter-unit task interdependence, on the other hand, is an element of uncertainty that is necessitated by Tushman and Nadler's selection of the subunit as the unit of analysis. Tushman and Nadler indicate substantial empirical support for the effect of each of these three components of uncertainty faced by the subunit.

Tushman and Nadler, like Galbraith, presuppose the fit-effectiveness hypothesis. They state, "Organizations will be more effective when there is a match between information processing requirements facing the organization and information processing capacity of the organization's structure"(Tushman and Nadler, 1978, p. 619). Thus, an organization must match the information processing requirements it faces with the information processing capacity of its structure in order to be effective.

```
┌────────────────────────┐        ┌────────────────────────┐
│ Information Processing  │        │ Information Processing  │
│      Requirements       │        │        Capacity         │
├────────────────────────┤        ├────────────────────────┤
│                        │        │                        │
│ Sources of Uncertainty:│        │ Structural Responses to│         ┌──────────────┐
│                        │───────▶│ Uncertainty:           │         │ Effectiveness│
│ 1. Task                │        │                        │  Fit ──▶│of Organization│
│                        │        │ 1. Rules, Programs,    │         └──────────────┘
│ 2. Environment         │        │    and Procedures      │
│                        │        │                        │
│                        │        │ 2. Hierarchy           │
│                        │        │                        │
│                        │        │ 3. Target and Goal     │
│                        │        │    Setting             │
└────────────────────────┘        └────────────────────────┘
```
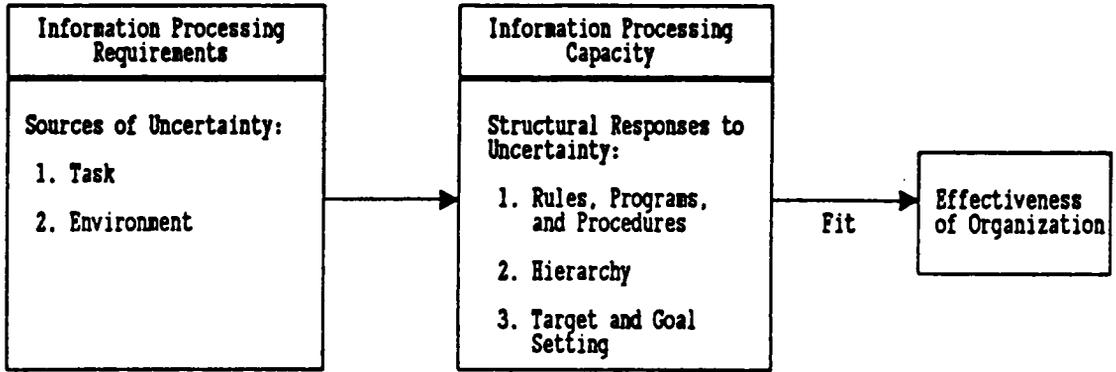
Figure 12.   Theoretical Model

4.5 A Synthesis of Galbraith's and Tushman and Nadler's Model

The basic theoretical model to be used in this research will be developed by synthesizing the work of Galbraith with Tushman and Nadler. Essentially, the model used here will rely on the basic model proposed by Galbraith, but will use Tushman and Nadler's expanded view of uncertainty. The model is presented in Figure 12 on page 94.

Task uncertainty and environmental uncertainty are viewed as the two major components of uncertainty faced by the organization. These two sources represent the logical split between uncertainty emanating from sources external to the organization and uncertainty emanating from sources internal to the organization. The combination of these two sources of uncertainty create the information processing requirements faced by the organization.

The information processing capacity of the organization is provided by its structure. The structure of a specific organization will include the particular combination of rules, procedures, and programs; hierarchy; and target or goal setting systems selected by that organization. These items represent the elements that, according to Galbraith, compromise the basic components employed by a bureaucratic organization to cope with uncertainty.

When the information processing requirements faced by an organization match that organization's information processing capacity a "fit" is said to be obtained and the organization is effective. A lack of fit is expected in the case where the information processing capacities do not match the information processing requirements. This lack of fit could result because the information processing capacities exceed the requirements, which implies inefficiencies resulting from the underutilized capacity. Alternatively, a lack of fit could result because the information processing requirements greatly exceed the information processing capacities. In this case, low levels of effectiveness would be expected because organizational decision-makers would not have sufficient information to make good decisions. In the extreme case, poor fit could result in significant declines in the economic performance of the organization.

4.6   Research Propositions

Before describing the research methods which will be used to examine the theoretical model of budget system usefulness which has been developed, several research propositions will be stated. These propositions are derived from the model developed. Additional support for each proposition will be cited from previous research.[6]

---

[6] A description of the operationalization of the model will be presented in the next chapter. Research hypotheses will be included at that point.

Proposition 1 As organizational units face higher levels of task and environmental uncertainty increased decision-making authority will be given to lower-level managers.

As noted in the preceding discussion, as both task and environmental uncertainty increase, the information processing requirements faced by the organization also increase. Therefore, to maintain the same level of information processing effectiveness, the organization will need to respond by increasing its information processing capacity. Decentralization was identified as one strategy that may be used to increase information processing capacity. Specifically, Galbraith suggests that as the communication channels to higher level organizational members become overloaded, organizations will decentralize, shifting decision-making authority to lower-level organization members who are closer to the relevant information. The empirical research of Burns and Stalker (1961), Lawrence and Lorsch (1967), and Pugh, Hickson, Hinings, and Turner (1969) all support the positive relationship between environmental uncertainty and decentralization.

No empirical studies were found which used the concept of task uncertainty. However, the related concept of organizational technology has been used in a number of studies. Both Reimann and Inzerilli (1979) and Fry (1982), in reviewing and summarizing the technology-structure literature, conclude that the linkages between these two constructs have been supported empirically.

Proposition 2 As organizational units face higher levels of task and environmental uncertainty high-level unit managers will find budgets to be less useful.

The second proposition addresses the direct relationship of both task and environmental uncertainty with the usefulness of budget systems. First, consider the effects of increasing levels of task uncertainty on budget usefulness. In a low uncertainty task, it is relatively easy to develop budget estimates of revenues and costs, such that variances between budgeted and actual amounts provide unambiguous signals to management. In high uncertainty tasks, however, variances between budgeted and actual results often do not provide unambiguous signals to management. Specifically, it may be difficult to discern whether the variances are due to poor performance or poor estimates. For example, Hirst (1987) presents a theoretical analysis which indicates that task uncertainty reduces the usefulness of budgets in motivating performance. Similar arguments may be made for environmental uncertainty.

Several empirical studies provide support for this proposition. Higher levels of uncertainty have been shown to be related to decreased reliance on management accounting system measures of performance (Govindarajan, 1984); decreased reliance on data which is internal, financial, and ex post (Gordon and Narayanan, 1984); decreased emphasis on formal budgeting (Merchant, 1984); and a desire for management accounting systems to include information that is external, non-financial, probabilistic, and received on a frequent and rapid basis (Chenhall and Morris, 1986).

The negative direct association predicted may seem inconsistent with the model proposed by Galbraith; recall, however, that Galbraith suggests that budget systems become useful as organizations decentralize. This indirect relationship is examined in the third proposition.

Proposition 3 As organizational units increase the decision-making authority of lower-level managers (due to higher levels of environmental and task uncertainty), high-level unit managers will find budgets to be more useful.

The third proposition is somewhat more complicated than the first two. Propositions one and two address the *direct effects* of perceived task and environmental uncertainty on both decentralization and budget system usefulness. The third proposition considers the *indirect effects* of these two sources of uncertainty, through decentralization, on budget system usefulness.

Galbraith provides the logical support for this proposition. As an organization decentralized in response to increasing levels of uncertainty, the potential for dysfunctional behaviors will increase. Specifically, as lower-level managers are given decision-making authority it is possible that they will make decisions that result in local benefits at the expense of global performance. Budget systems may be used to partially mitigate this potential problem.

To date, few empirical studies have explicitly examined this indirect effects proposition. Merchant (1981) observed a high positive correlation between decentralization and the tightness of the link between the budget and reward

system. Chenhall and Morris (1986) studied the relationships between the environment, structure, interdependence, and management accounting systems. Their results generally support an indirect effects proposition between environmental uncertainty and interdependence, through decentralization, on the perceived value of certain information characteristics.

Proposition 4 Organizational units which fit the amount of decision-making authority given to lower-level managers and the usefulness of budgets to upper-level managers to the levels of task and environmental uncertainty faced by their unit will be more effective than units which do not.

The fourth proposition states that those organizations that properly match their capacity to process information with the requirements to process information will perform better than those which do not.

Several accounting studies have explicitly tested the fit-effectiveness proposition. Merchant (1981) found that organizations which that obtain a good match between control strategy and context exhibit statistically significant higher performance than those that do not. Govindarajan (1984) reports that the correlation between environmental uncertainty and the percentage of bonus determined by subjective criteria is stronger for units with high performance than for units with low performance.

4.7   Chapter Summary

A model of budget system usefulness has been developed in this chapter. This model is based on the conceptual work of Galbraith. Galbraith work was selected because of its conceptual clarity and superiority over models previously developed in the accounting and organization literature. Based upon the model, four research propositions have been proposed. The specific methods used to empirically examine this model are presented in the next chapter.

Chapter 5

Research Methods

5.1 Introduction

A theoretical model of budget usefulness built around Galbraith's (1973) contingency theory was described in the previous chapter. The objective to be accomplished in this chapter is to describe the research methods which will be used to empirically examine the theoretical model.

The chapter will begin with the rationale for the particular research methodology selected to examine the model. The joint problem of operationalization (converting the theoretical model's abstract concepts into measurable constructs) and measurement (selecting specific techniques to measure the operationalized concepts) will be addressed in the second section of the chapter. The population

which will be studied, and the process used to develop and pretest the study instrument will be contained in the third and forth sections of this chapter respectively. The fifth section will contain the methods used to assess the reliability and validity of the measurement methods used, whereas the sixth section will present the statistical data analysis methods which will be employed to examine the model. The final section will include a brief summary of the research methods as presented in this chapter.

5.2   Research Methodology Selection - Rationale

The first major methodological decision involved the selection of a basic method to be used to examine the model. While many potential research methodologies exist, three methodologies were given closer scrutiny for the present study. The methods considered were an experiment, a field study (or studies), and the survey method. Other methodologies, such as analytical modeling or historical research were not considered due to their inappropriateness for the present topic.

Experimental research methods have many strengths including the high degree of control over the study and a rich set of designs and statistical models (Kerlinger, 1973) However, the experimental method is most effective in examining phenomena at the individual level of analysis. The present study however is directed towards a collection of phenomena that are hypothesized to

exist at the subunit and organizational levels of analysis. Experimental methods are not particularly strong in this setting and have, therefore, not been used in the present study.

Field research methods are frequently used to study phenomena at the organizational level of analysis (Yin, 1984). Indeed many organizational and accounting researchers have recently called for research conducted using field methods. For example, Otley (1980) concludes his review of the contingency theory literature in accounting by calling for field-based research directed towards theory development.

While field research and, qualitative research in general, have significant strengths in examining complex social phenomena, these methods suffer from a higher degree of subjectivity than do quantitative methods.[7] Furthermore, while field-based research is most fruitful in the early development stages of inquiry the present study is oriented towards testing a particular theory (Yin, 1984). Thus the field research method was not selected for the present study both due to its degree of subjectivity and lack of appropriateness for theory testing.

Due both to the weaknesses of the experimental and field methodologies, and its own strengths, the survey method has been selected for this study. The survey method has been used extensively to examine organizational-level phenomena in

---

[7] A portion of this difference is due to the different underlying epistemological and ontological assumptions of these methods. See Lincoln and Guba (1985) for an excellent discussion of the phonomenological perspective.

a host of disciplines. Indeed virtually all of the accounting studies reported to date have used some variation of this method. Furthermore, the survey method, as will be shown later in this chapter, will provide data suitable for statistical analysis of the model.

While the survey method overcomes the primary weaknesses of the experimental and field methods, in the context of the present study, it is not without its own weaknesses. The two major weaknesses of the survey method are variable measurement and respondent cooperation. Variable operationalization and measurement and respondent selection will be addressed in the next two sections of this chapter.

5.3   Variable Operationalization and Measurement

The process of operationalizing the theoretical model's constructs and selecting the measurement methods to be used required a number of decisions to be made. This section includes a description of the decisions made on a variable by variable by variable basis. Before the specific measurement methods selected are identified, several guiding principles used should be mentioned.

5.3.1 General Approach

The following general approach was used in the process of operationalizing and selecting measurement methods for each of the variables. First, for each major construct a thorough review of the literature was performed. This review included both the accounting and organizational literature, as appropriate. From the literature various measures and their relative strengths and weaknesses were identified. Next, the measurement methods identified were evaluated using the following selection principles. The first selection principle was appropriateness for the present study. When multiple methods were available, consideration was given to their appropriate for this particular study and the expected respondent group. A second, and related, selection principle was brevity and simplicity. Due to the large number of variables being examined and the use of a mail survey short, simple methods and questions were favored over long and/or complex questions.

The unique issues involved in the operationalization and measurement of each construct from the theoretical model are presented in the following sections. An operationalized version of the model developed in the previous chapter will be included as the final section.

5.3.2   Task Uncertainty

Both Galbraith (1973) and Tushman and Nadler (1978) explicitly recognize that different organizations (and subunits) face different degrees of uncertainty as a result of the type of tasks they perform. Galbraith states "Uncertainty is the relative amount of information that must be acquired during task performance" (1973, p. 5).

Task uncertainty has not received a great deal of attention in the contingency literature. However, technology, a related concept, has occupied a central role beginning with the work of Woodward (1965) and Perrow (1967).[8]

A broad variety of measures of technology have been developed as a part of this literature. For example, Van de Ven and Delberq (1974) developed a measure of technology specifically for governmental employment-security agencies. As would be expected, many of the measures developed and used such as those used by Reimann (1977), were designed for manufacturing organizations.

Many of the previously developed measures, because of their specificity, will not be useful in the present study. Both manufacturing and service organizations will be included in the study and, therefore, the measure for task uncertainty to be used must be appropriate to a number of different organizations. An instrument

---

[8]   See Fry (1982), Gerwin (1979), and Gillespie and Mileti (1977) for reviews of the technology-structure literature.

developed by Richard Daft and Norman Macintosh (Daft and Macintosh, 1981) has been selected as it is not limited to a particular context.

Daft and Macintosh's instrument was developed as a part of a study which considered the effect of task uncertainty on the amount and equivocality of information processing for work units. Daft and Macintosh decomposed task uncertainty into two dimensions: task variety and task analyzability. Task variety is defined as "the frequency of unexpected and novel events that occur in the conversion process" (Daft and Macintosh, 1981, p. 208). Task analyzability is defined as "how individuals respond to problems that arise" (Daft and Macintosh, 1981, p. 208).

The instrument itself consists of both questions, five for each dimension of task uncertainty. Daft and Macintosh report these questions to have internal reliability measures (Nunnally's coefficient alpha) of .86 for the analyzability questions and .77 for the variety questions (Daft and Macintosh, 1981, p. 214).

The major limitation on the usefulness of Daft and Macintosh's measure for the present study is that the items were originally designed to be completed by each member of a specific organizational unit and averaging these responses to determine an overall score. Daft and Macintosh (1981) do report that based on a one-way analysis of variance test the null hypothesis that all individuals are responding about similar tasks was rejected for both measures ($p < .001$). Thus the question items do seem to measure unit-level rather than individual traits.

It should be noted that the measure selected will rely on the business unit

manager's perceptions of task uncertainty. To highlight this fact, this variable

will be labelled *perceived task uncertainty* in all subsequent discussion and

analysis.

5.3.3 Environmental Uncertainty

In addition to the uncertainty faced by an organizational unit from its task, Mike

Tushman and David Nadler identify a unit's environment as a major source of

uncertainty. They state "The environment is generally seen as a source of

uncertainty, since areas outside the organization (or subunit) are not under the

unit's control and are therefore potentially unstable" (Tushman and Nadler,

1978, p. 616).

A great deal of attention and effort has been directed towards identifying and

measuring environmental uncertainty.[9] However, while this construct and its

measurement has attracted a great deal of attention, few satisfying solutions have

been obtained. For example, Lawrence and Lorsch (1967) developed a measure

of environmental uncertainty which was later called into question by Tosi, Aldag,

and Storey (1973).

---

[9] See reviews of this literature by Downey, Hellriegel, and Slocum (1975) and Downey and Slocum (1975).

The measure of environmental uncertainty used in this study is taken from the work of Raymond Miles and Charles Snow (Miles and Snow, 1978). This particular measure decomposes the environment into six sectors consisting of suppliers, competitors, customers, financial/capital markets, government regulatory agencies, and actions of labor unions. Within each dimension several items are posed to which the respondent is asked to indicate the predictability of that particular item.

One significant change has been made to the original instrument. This change is the addition of an additional environment dimension. The original questionnaire was developed for use by CEOs, who manage complete businesses. However, in the present study, the questionnaire will be completed by organizational subunit managers. An organizational subunit has an additional environmental dimension -- other subunits of their own organization. This additional dimension was added to the instrument.

Again, as in the case of task uncertainty, the measurement method selected will rely on the manager's perceptions of environmental uncertainty. Thus, this variable will be labelled *perceived environmental uncertainty* in subsequent discussion and analysis.

5.3.4 Decentralization

As a particular organizational unit faces higher and higher levels of uncertainty, both from its environment and task, it will become necessary for the unit to increase its information processing capacity. A primary structural response will be to decentralize decision-making authority. Decentralization allows managers who possess the specific information necessary to make a decision to do so. Galbraith states: "Then as unanticipated events arise, the problem is referred to the manager who has the information to make a new decision" (Galbraith, 1973, p. 11).

The measure of decentralization originally developed by the Aston group (Pugh, Hickson, Hinings, and Turner, 1968) will be used. This instrument asks for the particular level within a unit that a collection of typical decisions can be made. This instrument has been used repeatedly in both the organizational and accounting literature.

5.3.5 Budget System Usefulness

A secondary response to higher levels of uncertainty is the implementation and use of target and goal-setting systems. The budget system of an organization is the primary system used for this purpose.

While a great deal of research effort has been directed towards the study of various aspects of budget systems, such as they degree of participation in the budget process and the amount of slack in budgets, no measures of budget system usefulness were found in the research literature. Therefore, a measure of budget system usefulness was developed specifically for this study. A description of how this measure was developed will follow.

The first stage was a review of the normative literature to determine what "uses" or roles were prescribed to budgets. Several authors have discussed the roles of budget systems. Anthony and Dearden (1980) prescribe two roles to budget systems - planning and control. Maciariello (1984) proposes that budget systems are a part of a larger management control system designed to assist management in planning, coordinating, decision-making, and evaluating. Barrett and Fraser (1977) consider the major roles of budgets to include planning, motivating, and evaluating, whereas the minor roles are coordinating and educating. Emmanuel and Otley (1985) describe the roles of budgets to include authorization, planning, communication and coordination, motivation, and performance evaluation.

From the collection of roles discovered in the literature, five roles have been distilled for use in the present study. They are: managing, planning, motivating, evaluating, and coordinating. Planning was selected as it was included in all of the lists mentioned above. Similarly, evaluating and coordinating were mentioned in three of the four lists located. Motivating was found on only two

of the lists, however, from reading the other author's work it seemed that this use was important and had been included under another heading, usually evaluating. Lastly the broad concept of managing was included as a catch all category.

A questionnaire to measure budget system usefulness was developed by designing several questions for each of these separate roles. For example, one of the questions designed for the motivating role is "Budgets are useful to motivate the personnel in this unit because they let people know what is expected of them." A total of fifteen questions were used in the final instrument. For each question the following five responses were provided: almost never, seldom, sometimes, often, almost always. Each answer was coded from one to five (one = almost never, five = almost always) and all answers were summed to determine the overall score for budget usefulness. The instrument was examined carefully and modified several times during the pretest process which will be described later in this chapter.

5.3.6 Effectiveness

The theoretical model specifies that a proper fit between the information processing requirements faced by and organization and the information processing capacity of the organization is a necessary condition for high levels of organizational effectiveness to be achieved. Organizations that fail to provide sufficient capacity will not achieve high levels of effectiveness due to insufficient

information necessary for proper decision-making. Similarly those organizations which choose information processing structures possessing capacities in excess of their requirements will also experience lower levels of effectiveness due to the unnecessarily high cost of these structures.

The measurement of organizational effectiveness occupies an enigmatic position in the organizational literature.[10] Perhaps this offers partial explanation for the general failure in previously reported contingency theory-based accounting research to measure this construct. Otley (1980) proposes that as an interim solution, that intervening variables such as performance should be considered.

A self-reported measure of performance developed by V. Govindarajan (1984) was used in the study. This instrument measures performance in a multidimensional fashion as has been proposed in the organizational literature (Sheer, 1977) and is appropriate for the anticipated respondent group.

The instrument consists of two sections. The first section requests that the respondent indicate the degree of importance attached by their superiors to each of twelve items in evaluating the performance of the unit. Individual items include such things as cash flow, return on investment, and personnel training and development, for example. The second section asks the individual to assess their unit's actual performance relative to the expected level for each of the same twelve items. An overall measure of performance is obtained by multiplying the

---

[10] See Steers 1975 for a review of this literature.

individual responses from the first section by their counterpart in the second section and summing the results.

The abandonment of effectiveness and selection of the intervening variable performance will need to be made clear in subsequent discussion and analysis. Therefore, future descriptions of this variable will use the label performance rather than the potentially misleading effectiveness.

5.3.7   Size

Up to this point each of the variables discussed is an operationalization of a specific construct from the theoretical model. However the final variable which will be measured is not present in the theoretical model.

Neither Galbraith nor Tushman and Nadler include size in their discussion and analysis. This can best be explained by recalling that the models developed by these researchers were purely theoretical -- that is neither model was subject to direct empirical examination. However, when attention is turned away from these purely theoretical discussions and directed towards the empirical literature, size is frequently included as an important variable. Kimberly (1976) reports that a total of 80 empirical studies have been published which examine size-structure relationships. Kimberly further notes that over 80% of the studies he reviewed use number of employees as the measure for size. All of the contingency-based

accounting studies reported to date have used the number of employees as their measure for size. These studies include Bruns and Waterhouse (1975), Rosenzweig (1981), Merchant (1981, 1984), and Rockness and Shields (1984). A logarithmic transformation of this measure will be performed prior to including it in the subsequent analysis to reduce the non-linearities frequently observed with this measure.[11]

In addition to specifying the measurement method to be used for size, the theoretical and empirical role should be indicated for this variable. Because neither Galbraith nor Tushman and Nadler explicitly include size in their theoretical models it will be included as a *control variable* and not as an additional causal variable requiring additional modification to the theoretical model.

5.4 Research Hypotheses

The theoretical model developed in chapter four will now be restated as an empirical model, based on the operationalizations provided in this chapter. Similarly the research propositions included in chapter four may be restated as research hypotheses at this point.

---

[11] Kimberly (1976) reports in a review of the use of size in organizational studies that the logarithmic transform is used in the majority of studies since 1970 which have attempted to correlate size with other structural variables.
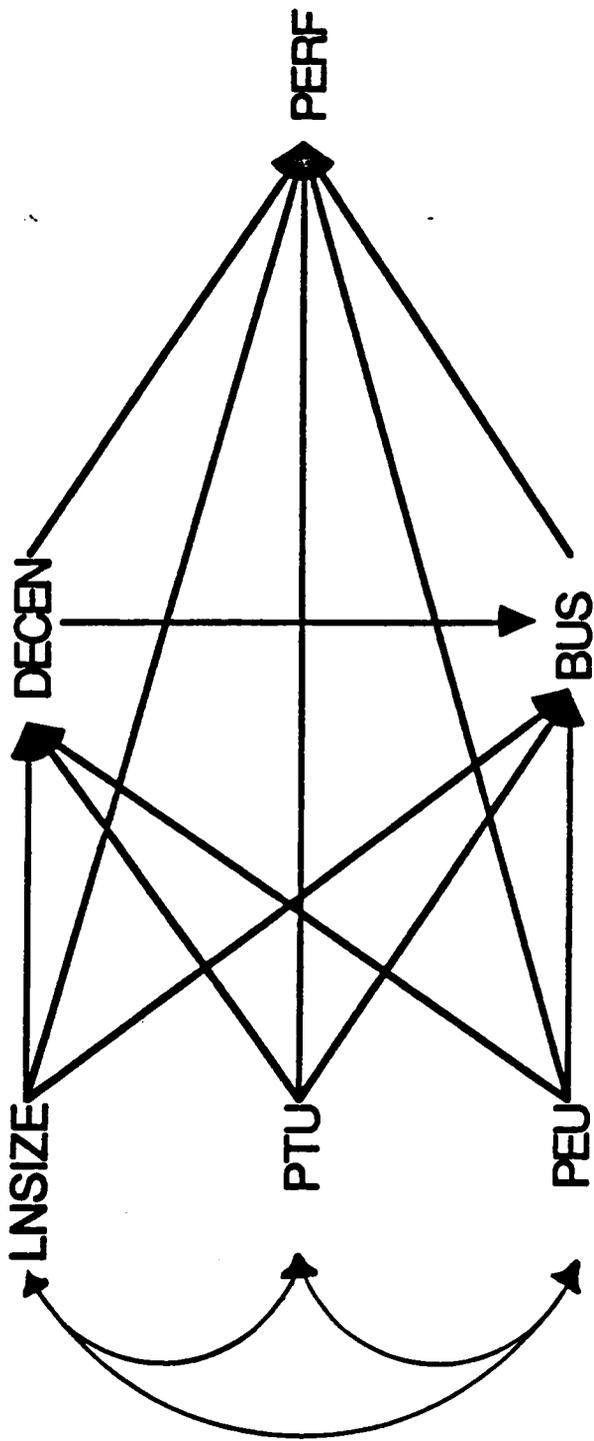
Figure 13.   Empirical Model

The empirical model is shown in Figure 13 on page 117. Note the following changes from the theoretical model. First, the original concepts of task and environmental uncertainty and effectiveness have been replaced with their operationalized variables, perceived task uncertainty (PTU), perceived environmental uncertainty (PEU), and performance (PERF). Second, the control variable size (LNSIZE) has been included as an exogenous variable. Third, the figure is drawn as a path diagram. The curved lines between the three exogenous variables represent spurious (i.e. not theoretically significant) relationships between size, perceived task uncertainty, and perceived environmental uncertainty. The straight lines represent the hypothesized relationships between the variables.

The following research hypotheses may now be stated:

Hypothesis 1:   There is a positive direct effect between both perceived task and environmental uncertainty and decentralization.

Hypothesis 2:   There is a negative direct effect between both perceived task and environmental uncertainty and budget system usefulness.

Hypothesis 3:   There is a positive indirect effect between both perceived task and environmental uncertainty (through decentralization) and budget system usefulness.

As noted in a previous section of this chapter two different statistical methods will be used to examine Proposition 4. Correspondingly Proposition 4 has been divided into two hypotheses: 4a and 4b.

Hypothesis 4a: There are positive indirect effects between both perceived task and environmental uncertainty (through

decentralization and budget system usefulness) and performance.

Hypothesis 4b: The direct and indirect effects of both perceived task and environmental uncertainty will be larger in absolute value for high performance firms compared to low performance firms.

Each of these hypotheses will be examined in the next chapter.

5.5 Questionnaire Development and Pretest

A multiphase process was used to develop and pretest the questionnaire used in this study. The following section will describe each step in this process as well as the results of the final pretest.

The first step was the development of the first draft of the questionnaire. The first draft was extremely "rough" and included a section for each variable to be measured. This draft was circulated among several members of the faculty of The R. B. Pamplin College of Business. Several modifications were made based upon the comments obtained during this first, preliminary phase. These changes included the type size, the addition of several demographic variables, the rewording of the general instructions, and the general layout of the budget usefulness questions.

During the second phase the first complete prototype of the questionnaire was completed. This prototype included not only a section for each of the variables but also instructions, a cover page, and questions about a number of demographic characteristics which were to be gathered from each respondent.

The prototype questionnaire was field tested by mailing the questionnaire to five different people. Each person possessed all the characteristics of the eventual respondent population.[12] Each field test subject was asked to read the instructions and complete the questionnaire. They were further instructed to note the amount of time required to complete all the questions and to make detailed notes about sections, questions, response formats, and any other items which were not meaningful or not clear. After the respondents had completed the questionnaire they were "debriefed" by the researcher. This debriefing included a section by section, question by question discussion of the instrument. When any problems were encountered potential solutions were discussed. Incremental modifications were made between each of the five field-test respondents. For example, early subjects had a difficult time answering the task uncertainty questions. From discussions with these subjects, it was observed that they were needed to be directed to first identify in their own minds what the task of their unit was. A question was added to that section which required the respondent to first record their unit's task before answering the subsequent questions. In addition the wording of several of the budget usefulness questions was changed to eliminate

---

[12] These characteristics will be discussed in the next section.

jargon and organization-specific language. Revised versions of the questionnaire were reviewed with two of the field-test respondents.

The third and final phase of the field test was performed to evaluate both the instrument as well as the distribution system planned for the questionnaire. A single organization was selected for this phase of the field test. The organization was a manufacturing organization which produced and sold specialty printing ink. The organization was divided up into a number of different territories with a single manager responsible for the operations in that territory. Territories ranged in size from four to fifty employees. The fact that some territories did not meet the minimum size criterion was not a significant problem as this phase of the pretest was primarily to examine the distribution method and to estimate the response rate. A total of twenty-four surveys were distributed within the pilot test organization. Nineteen of these questionnaires were received back by the researcher.

In addition to the qualitative evaluation of the instrument during pretest, a quantitative analysis was also performed. Statistical analysis including univariate statistics were computed for each variable. Additionally inter-variable correlation coefficients were computed and examined.

This final phase of the pretest resulted in two significant changes to the questionnaire. The first charge was the substitution of the Miles and Snow (1978) environmental uncertainty measure for the researcher-developed measure

included in the questionnaire. This substitution was made due to validity issues arising out of the researcher-developed questions, the failure of the researcher-developed measure to be positively correlated with the decentralization measure in the pretest data, and the discovery of an acceptable, previously developed environmental uncertainty measure subsequent to the analysis of the pretest data.

The second major change to the questionnaire was a change in the response format for the budget usefulness questions. The prototype questionnaire had used strongly disagree, disagree, no opinion, agree, and strongly agree, as the verbal anchors for the five response blocks. Discussion with several respondents revealed that these anchors were eliciting their opinions about budgets *in general*, rather than about how useful they found budgets to be in their organization. Furthermore the "no opinion" choice was not seen as a mid-point between strongly disagree and strongly agree but rather as an option similar to "Not applicable." The verbal anchors used in the final version seemed both to the researcher and to several discussants to be more appropriate for the intent of the questions.

The final version of the questionnaire is included as Appendix A. This appendix also includes copies of the cover letters which were mailed with the questionnaire.

5.6 *Sample*

Identification and solicitation of an adequate sample was critical to the success of the study. The rationale for the specific respondent attributes sought, the methods used to identify potential respondents, and the methods used to distribute the questionnaires to the potential respondents are contained in this section.

5.6.1   A Rationale for Respondent Characteristics

The following characteristics were selected as necessary for qualification to participate in the study. Each respondent should be held responsible for the profits of his or her unit, have at least forty employees in the unit, and have a unit with at least three layers or levels of employees.

Profit center managers were targeted because they were obtainable in sufficient numbers to allow for the subsequent statistical analysis planned and could reasonably be expected to use budgets. Profit center manager is used here to refer to both managers of units which are evaluated on profit and return on investment. Cost center and revenue center managers were not used as these managers are expected to have essentially different type of budgets than those used in profit centers.

The minimum unit size of forty employees was set to eliminate small profit centers such as regional sales offices within which decentralization is unlikely. Similarly the units were required to have at least three levels of employees to which decision-making authority could be delegated. A respondent which possessed all three of these characteristics could reasonably be expected to have knowledge about all the questions contained in the survey.

5.6.2 Identification of Potential Respondents

Identification of potential respondents represented a significant obstacle in the data collection process. No naturally occurring group was identified which could be reasonably expected to possess the desired characteristics. The following methods were used to overcome this obstacle.

Potential contacts were identified by reviewing the membership lists of both The R. B. Pamplin College of Business Advisory Council and the Advisory Council of the Department of Accounting. This group includes a number of highly placed corporate executives. Membership lists were obtained from both the Dean of the College and the Head of the Department. From these lists both potential "sponsors" and respondents were identified.

A final group of potential respondents was identified from reviewing the mailing list for The R. B. Pamplin College of Business *The Business Letter*[13] mailing list. Essentially individuals with job titles which were likely to possess the respondent characteristics were selected. Because the surveys were distributed differently to each of these three groups, a separate discussion of each group will be included in the next section.

5.6.3 Survey Distribution Methods

Advisory Council members which were identified as potential "survey sponsors" were primarily high-level corporate executives. For example, the CEO of a major regional bank was included in this group. A "bundle" was mailed to each of these sponsors. Each bundle contained the following items. First, a cover letter signed by either the Dean or the Department Head, depending on which Advisory Council the sponsor belonged to. This cover letter explained the overall purpose of the study, what was needed from the sponsor, and a request that the sponsor participate. Second, a set of detailed instructions explaining the desired characteristics of the respondent and the process to be followed in selecting respondents and distributing the questionnaires. Third, a draft of a corporate sponsorship letter to be typed on corporate letterhead and included with the questionnaires which were distributed. Fourth, a survey sponsor form reply

---

[13] *The Business Letter* is a quarterly publication of The R. B. Pamplin College of Business which describes the activities and achievements of the college's faculty and students.

which was to be mailed back to the researcher indicating how many and when the surveys were distributed to potential respondents. Lastly, a number of survey packets, ready for distribution to the respondent. Appropriate quantities of packets were chosen for each respondent depending on organization size and expected level of sponsor commitment.

In addition to the sponsors selected from the two Advisory Councils a number of potential respondents from these councils were also identified. Potential sponsors were mailed questionnaire packets directly and include a cover letter from either the Dean or the Department Head as appropriate requesting their participation in the study.

The final group of individuals which were selected from *The Business Letter* mailing list received a survey packet containing a cover letter signed by the researcher. The specific number of surveys mailed and the number which were returned will be discussed in the next chapter.

5.6.4   Reliability and Validity Assessment

A critical concern in any empirical social science research project is the reliability and validity of the measurement methods used. If evidence supporting both the reliability and validity of the measurement methods chosen cannot be found then the quality and trustworthiness of the research findings becomes suspect.

A reliable measurement method is one which provides consistent measurements for the same phenomena. For example, if a ruler was used to measure the length of a stick reported different lengths in each of several trials then the reliability of the ruler (or the person using the ruler!) would have to be questioned. Kerlinger states:

> So it is with psychological and educational measurements: they are more or less variable for occasion to occasion. They are stable and relatively predictable or they are unstable and relatively unpredictable; they are consistent or not consistent. If they are reliable, we can depend on them. If they are unreliable, we cannot depend on them. (1973, p. 443)

Thus, it should be noted that reliability is not essentially an absolute concept, but rather a relative one - more reliable measurements methods are preferred over less reliable measurement methods.

For social science data, particularly data collected using surveys or questionnaires where multiple questions are asked about the same construct, a standard statistical measure of reliability is Cronbach's alpha (Carmines and Zeller, 1979). This statistic will be computed for each variable measured.

Reliability is a necessary, but not sufficient, component of the quality of a measurement method. The other component is validity. A simple working definition for validity is found in Wright (1978). He states: "a measurement instrument is *valid* if it in fact measures the concept under investigation" (Wright, 1978, p. 48). A number of different descriptions and definitions of validity may be found in the literature, but of particular interest in the present study is

evidence of the *construct validity* (Carmines and Zeller, 1979) of the measures used. Carmines and Zeller define construct validity as " the extent to which a particular measure relates to other measures consistent with theoretically derived hypotheses concerning the concepts (or constructs) that are being measured"(1979, p. 23).

The construct validity of the environmental uncertainty, task uncertainty, and decentralization measures used will be evaluated through examining the correlation coefficients between these variables. Based on the results of numerous previous studies both environmental and task uncertainty are expected to be positively associated with decentralization.

The assessment of the validity of the budget system usefulness measure is simultaneous more difficult and more important. In order to provide some evidence related to the construct validity of the budget system usefulness a second budget measure, budget use, will also be collected.

Because the measure developed for budget system usefulness was both new and yet critical to the study a measure of budget system use was also developed. As noted above, the primary purpose of this measure is to assist in establishing the validity of the budget system usefulness measure.

A measure of budget use was designed by taking several questions items from Merchant (1978) and by constructing several additional questions. A total of

eight questions are used in the final instrument. An overall budget use measure was computed by equally weighting each question's response. Positive correlation between the budget system usefulness measure and the index of budget use will provide evidence of the validity of the budget usefulness measure.

5.7 Statistical Data Analysis Methods

A variety of statistical data analysis methods will be used to analyze the data collected in the study. The methods selected and the rationale for their selection will be included in this section.

The first analysis to be performed on the data will be univariate analysis for each variable. In addition to basic descriptive statistics such as mean, median, range, and variance, Chronbach's alpha will be computed as a reliability estimate for each variable.

These statistics will be computed for several reasons. First, these statistics will provide insight into the adequacy of the measurement instruments used in the study. For example, descriptive statistics for the performance measure will be useful in assessing whether significant self-report bias is present in the data. A second reason for examining the univariate properties of the data will be to highlight unusual properties in the data which could influence the subsequent multivariate analysis. For example, highly skewed data, as evidenced by means

not close to the midrange of the measure could lead to problems in the subsequent analysis.

The second phase of data analysis will be to examine the zero-order correlation coefficients between each of the variables in the study. This analysis will be used first to assess the validity of the measurement instruments as described in the previous section. Second, the results of this method will be useful to examine relationship investigated in prior research which tended to utilize zero-order correlation analysis.

The univariate and bivariate analyses will be performed using the SAS package (SAS, 1985). Specifically, the PROC UNIVARIATE and PROC CORR procedures will be used to compute the statistics included in the first and second phases of the analysis.

The third phase of the analysis will be to construct and examine the complete model using path analysis. Dillon and Goldstein describe path analysis as "a method of studying patterns of causation among a set of variables" (1984, p. 431). More specifically, path analysis provides a method to decompose zero-order measures of association into direct and indirect causal effects (Wolfle and Ethington, 1985). This analysis will be aided through the use of a package called GEMINI (Wolfle and Ethington, 1985). Path analysis was selected for a simple reason -- the theoretical model derived from the work of Galbraith (1973) and Tushman and Nadler (1978) contains both direct and indirect causal connections.

More specifically the path analysis will be performed in two stages. First the basic theoretical model will be examined. To review, this model includes environmental and task uncertainty as sources of uncertainty which influence directly the level of decentralization chosen by the firm and both directly and indirectly (acting through decentralization) the usefulness of the firm's budget system.

In the second stage of the analysis an additional variable -- performance -- is added to the model to examine the fit-effectiveness hypothesis. Two different strategies will be used to examine this model. The first strategy will be to simply include performance as a third endogenous variable within the basic theoretical model. The second strategy will be to use performance as a grouping variable. The data will be divided into low performance and high performance groups. Separate path models will be computed for these groups and differences in the resultant path coefficients will be examined. While both strategies address the same issue and will produce similar results, they should provide different insights into this complex set of relationships.

5.8   Summary of Research Methods

The methods which will be used to investigate the theoretical model presented in Chapter 4 have been included in this chapter. The survey research method has

been selected to test the model. A survey instrument was constructed and pilot-tested using previously-developed measures for task and environmental uncertainty, decentralization and performance. A new instrument to measure budget usefulness has been developed for the research project. Data collection methods and the respondent group were discussed followed by a presentation of the methods which will be used to examine the reliability and validity of the measurement methods. The chapter concluded with an outline of the data analysis method which will be used including univariate analysis, zero-order correlation analysis, and path analysis. The research results will be presented and discussed in the next chapter.

Chapter 6

Research Results

6.1 Introduction

A theoretical model of budget system usefulness based upon a contingency perspective and the research methods which were used to test this model were presented in the previous chapters. The results of an empirical test of this model are contained in this chapter.

This chapter is organized into two major sections. The first section includes the preliminary analysis of the results. The preliminary analysis section includes subsections presenting the response rates from the survey, the demographic characteristics of the survey respondents, and both univariate and bivariate descriptive statistics for the data collected.

The second section of this chapter includes the primary analysis of the data. This analysis is based upon path analytic models and is subdivided into two subsections. The first subsection presents the analysis of the basic model, whereas the second subsection presents the analysis of an extension of the basic model. The chapter concludes with a section which includes a summary of the preliminary and the primary analysis.

6.2 A Preliminary Analysis of the Results

Before the primary analysis of the results can be discussed, a number of preliminary matters need to be addressed. This section presents these preliminary matters.

6.2.1 Response Rates

As described in the previous chapter a mail survey was used to gather the data which was used to examine the model of budget system usefulness. Table 3 on page 135 contains the response rates obtained from the mail survey.

The first section of the table contains the total number of surveys distributed, broken down by the method of distribution. A total of 182 (42.9%) of the 424

Table 3. Response Rates for Mail Survey

Surveys Distributed:		#	%
To respondents through corporate sponsors		182	42.9
Directly to respondents:			
College of Business sponsorship (COB)		45	10.6
Direct mail for the *Business Letter* list (BL)		197	46.5
Total Surveys Distributed		424	100.0

Response Rates:

Corporate Sponsors:			
Total mailed			182
Surveys returned, not willing to participate			24
Surveys not distributed or returned			25
Adjusted Total Surveys Distributed			133
Responses			100
Non-responses			33
Total			133
Response rate, based on adjusted total			75.2%

Direct Mailings:	COB	BL	Total
Total mailed	45	197	242
Survey returned, not deliverable	1	3	4
Adjusted Total Surveys Distributed	44	194	238
Responses	29	52	81
Non-responses	15	142	157
Total	44	194	238
Response rate, based on adjusted total	65.9%	26.8%	34.0%

Combined Data:			
Surveys mailed			424
Surveys returned, various reasons			53
Adjusted Total Surveys Distributed			371
Responses			181
Non-responses			190
Total			371
Response rate, based on adjusted total			48.8%

surveys were distributed through corporate sponsors. The remaining surveys were distributed directly to the respondents. Forty-five surveys (10.6%) were distributed directly to respondents and included a cover letter from either the Dean or the Department Head - Department of Accounting of The R. B. Pamplin College of Business. The remaining 197 surveys (46.5%) were distributed without any corporate or college sponsorship to names drawn from *The Business Letter* mailing list.

Before response rates were computed several adjustments have been made to the total surveys distributed. These included surveys for sponsors who did not choose to participate, some of whom returned the uncompleted surveys to the researcher, some who did not. Adjustments were also made to the direct mail group for surveys returned as undeliverable by the U.S. Post Office.

After adjustment, a 75.2% response rate was obtained from the corporate sponsor group whereas only a 34.0% response rate was obtained from the direct mail group. An overall response rate for the combined groups of 48.8% was obtained.

Because somewhat different methods were used to contact each of these groups a multivariate analysis of variance (MANOVA) was performed using the corporate sponsor and the direct mailings as the independent variable. No significant difference were observed at the $\alpha = .05$ level between these groups.

This result was interpreted to support the use of the combined data in all subsequent analyses.

In addition to collecting these response rate statistics, a test for non-response bias was performed. The test for non-response bias involved partitioning the data into two groups based on the date received. This test compared the early respondents with the late respondents. A multivariate analysis-of-variance test (MANOVA) was used. No significant differences were observed between the early and the late respondents.

6.2.2 Demographic Characteristics of Respondents

In addition to the survey questions related to each variable, several questions were included to collect demographic data about the respondents. Table 4 on page 138 contains these data.[14]

As can be seen from the table the respondents were almost completely males, with an average age of 46.5 years. The majority of the respondents (over 91%) had at least a 4-year college degree with almost one-third having completed some form of graduate degree program. While the respondents came from a variety of

---

[14] As indicated in the previous section, a total of 181 responses were obtained. However, for a variety of reasons, not all responses proved to be usable. Table 4 on page 138 presents data only for the usable responses. See Appendix B for detail about coding and further discussion about which responses have been selected for analysis.

Table 4. Demographic Characteristics of Respondents and Business Units

Characteristics of Respondents:

Average age	46.5	

Sex:

Males	101	
Females	2	
	103	

Highest level of education completed:	#	%
High school diploma	1	1.0
2-year associates degree	8	7.8
4-year college degree	61	59.2
Graduate degree	33	32.0
	103	100.0

Professional background:	#	%
Production/Operations	32	31.1
Marketing/Sales	22	21.4
Finance/Accounting	34	33.0
Engineering/Research & Development	5	4.9
Other	10	9.6
	103	100.0

Average time in current position (in years)	5.6	

Characteristics of Business Units:

Average age of units (in years)	27.9	

Industry type:	#	%
Service	43	41.7
Manufacturing	45	43.7
Other	15	14.6
	103	100.0

different professional backgrounds, they tended to be concentrated in the areas of production/operations, marketing/sales and finance/accounting. The average respondent had held his/her current position for 5.6 years.

In addition to the respondent's characteristics, two questions were focused on the characteristics of the business unit itself. The business units included the respondent sample had existed for an average of 27.9 years. These units were distributed between service (41.7%), manufacturing (43.7%), and other (14.6%) industries.

To summarize, the demographic characteristics of the respondents support the assertion that the data was collected from older, male, well educated, and experienced group of business unit managers. Furthermore these managers manage business units which have existed a reasonably long time and are spread out between various industry categories. Such a group of managers and business units should provide an adequate source for the data analyzed in this chapter.

6.2.3 Descriptive Statistics

Before the variables were input into the primary analysis -- the path models -- a number of descriptive statistics were computed. These statistics will be presented in two sections. The univariate descriptive statistics will be presented and discussed first followed by the bivariate statistics.

6.2.3.1 Univariate Descriptive Statistics

A number of univariate descriptive statistics which were calculated for each variable are included in Table 5 on page 141. The theoretical and actual range, mean, and standard deviation are displayed. The theoretical range is the minimum and maximum possible score which theoretically could be observed whereas the actual range is the minimum and maximum taken from the data collected. Rather than review each variable separately each column will be examined.

In addition to the full name of each variable, a code name has been assigned which will be used in future tables and figures. The theoretical range for each variable was calculated by computing the minimum and maximum possible score based on the instrument used. For example, the task uncertainty measure was based on the responses to ten separate questions. Each answer ranged from one to five. Thus the minimum score was ten and the maximum was fifty. The only exception to this is the size measure which had a lower limit of forty, but no upper limit.

The actual range observed in the data is presented in the fourth column. As can be seen in the table, the actual observations for each variable extended over a reasonably large range for each variable. This evidence indicates that the

Table 5. Descriptive Statistics

Variable	Code Name	Theoretical Range	Actual Range	Mean	Standard Deviation
Perceived Task Uncertainty	PTU	10-50	18-45	30.4	5.20
Perceived Environmental Uncertainty	PEU	0-95	15-62	42.7	9.61
Size	SIZE	>40	45-12,000	907.1	1,729.45
Decentralization	DECEN	0-50	4-37	18.0	5.73
Budget Usefulness	BUS	15-75	27-75	56.9	9.56
Performance	PERF	12-300	76-254	155.5	37.96

Number of observations = 103

instrument used produced a reasonable range of responses from the respondent group.

The mean and standard deviation for each variable are included in the fifth and sixth columns, respectively. The mean for each variable are all reasonable near the middle of the theoretical range which indicates that the responses are spread across the range and not generally bunch at one end or the other. The standard deviations also support this conclusion.

Several additional comments should be made with regard to the size measure. The size measure used was number of employees. As mentioned in the measurement section of the research methods chapter, previous studies have typically used a logarithmic transformation to reduce non-linearities in correlation between size and the other measures. A natural log transformation was used in this research. The mean and standard deviation of the transformed data are 5.79 and 1.30, respectively. The code name for the transformed size measure is LNSIZE.

On the whole, the univariate descriptive statistics for each variable provide support to the conclusion that the data collected will provide adequate input into the multivariate path model which used in the primary analysis.

6.2.3.2 Bivariate Statistics

	PTU	PEU	LNSIZE	DECEN	BUS
PEU	0.07380 (0.4588)				
LNSIZE	0.11565 (0.2447)	0.22833* (0.0204)			
DECEN	0.04020 (0.6868)	-0.03797 (0.7034)	0.21774* (0.0271)		
BUS	0.08609 (0.3872)	0.15033 (0.1296)	0.37445* (0.0001)	0.05289 (0.5957)	
PERF	0.12624 (0.2039)	0.06345 (0.5243)	0.26403* (0.0070)	-0.07202 (0.4697)	0.26782* (0.0062)

Table 6. Pearson Correlation Coefficients (N = 103)

* Significantly different from zero at the α = .05 level.

In addition to the univariate statistics presented in the previous section, the bivariate Pearson correlation coefficient was computed for all variables in the study. Table 6 on page 143 presents the half-matrix of these correlation coefficients along with the p-value for the null hypothesis that each coefficient is equal to zero.

Five of the fifteen correlation coefficients proved to be statistically significantly different from zero. Of these five coefficients four involved the size measure. In fact size was positively correlated with all of the study variables except for task uncertainty. The other significant positive correlation observed was between budget system usefulness and performance.

Three of the remaining coefficients were moderately large (r > .10), but not statistically significant at the α = .05 level. Positive correlation coefficients were observed between perceived task uncertainty and size, perceived task uncertainty and performance, and perceived environmental uncertainty and budget system usefulness. It should be noted that the small sample size (N = 103) provides a partial explanation of the lack of statistical significance between some of the variables. Specifically, a correlation coefficient must be greater than .197 in order to be statistically significant at the α = .05 level. If, however, the sample size had been increased to say 200, a coefficient of only .139 would be significant at the same alpha level (Neave, 1978).

The correlation matrix provides a number of insights into and raises several questions about the data. Because most of these insights and questions will be addressed more fully in later sections of this chapter further discussion of these results will be postponed.

6.2.4   Reliability and Validity Assessment

This final section of the preliminary analysis describes several statistical tests performed to assess the reliability and validity of the data collected. Reliability will be presented first followed by validity.

6.2.4.1   Reliability Assessment

As discussed in the research methods chapter, reliability refers in this context to the consistency of a measurement. The reliability of the measures used was assessed by computing Cronbach's alpha for each variable. The results of this procedure are presented in Table 7 on page 146.

As can be observed in the table the alphas computed ranged from .66 (PEU) to .91 (BUS). While J.C. Nunnally proposed that for exploratory research an alpha greater than .5 was satisfactory, alphas above .8 were preferred. Given this criterion, then reliability of the budget usefulness measure is quite good with the

	Table 7. Coefficient Alpha	
	Variable	Coefficient Alpha
	PTU	.79
	PEU	.66
	DECEN	.76
	BUS	.91
	PERF	.77

other measures proving to be acceptable, but not outstanding. The one exception to this is the perceived environmental uncertainty measure which has a sufficiently low alpha to raise concern for its reliability.

6.2.4.2 Validity Assessment

While reliability refers to the consistency of a measurement method, validity refers to the appropriateness of a measurement method. Validity assessment attempts to answer the question "Does a particular measurement method measure what it claims to measure?" In the context of this study, the construct validity of the perceived task uncertainty, perceived environmental uncertainty, size, and decentralization measures will be assessed by comparing the correlation between these variables to results obtained in previous studies.

Based on the results of previous research, perceived task uncertainty, perceived environmental uncertainty, and size have all generally been associated positively with decentralization.[15] In the present study while positive correlation is observed between size and decentralization (r = .22) and perceived task uncertainty (r = .04), a weak negative association was observed between perceived environmental uncertainty and decentralization (r = -.04). While the correlation between size and decentralization is statistically significant at the $\alpha = .05$ level, both the

---

[15] Inkson, Pugh, and Hickson (1970) observed a positive association between workflow integration (a concept related to task uncertainty) and size with decentralization. In an accounting study Merchant (1981) observed similar results. The association between environmental uncertainty and decentralization is found in Lawrence and Lorsch (1967) and supported in an accounting context by Chenhall and Morris (1986).

coefficients between the uncertainty measures are not significantly different from zero at the same confidence level.

As discussed in the measurement section of the research methods chapter the measurement of environmental uncertainty has consistently proven to be a difficult and troublesome task. The primary problem is that different measurement methods, while purporting the measure the same construct often result in conflicting results. The present study appears to be yet another example of this problem. Specifically while other measures of environmental uncertainty have usually been observed to be positively associated with decentralization, the present method is weakly associated in a negative direction.

A closer examination of the data, combined with the discussion of the instrument used to measure environmental uncertainty provides additional insight into this unexpected result. Miles and Snow (1978) examined differences in environmental uncertainty between top executives in the food processing and electronics industries. Their results (Miles & Snow, 1978, pp. 199-204) supported their expectation that differences would exist *between* industries. However, a much larger amount of variation existed *within* the two industries studied. Miles and Snow explored this unexpected result further and found that within industry differences were at least partially explained by differences in the structures of the various firms studied. Specifically many firms had created subunits to absorb environmental uncertainty such as sophisticated marketing departments. Once

an organization had adapted through the creation of buffering, adoptive subunits, the top executive no longer perceived the same level of uncertainty.

Examining the data collected in the light of this notion yields the following explanation of the results obtained. A strong positive correlation was observed between size and decentralization ($r = .22$, $p < .03$). Thus the larger business units were more decentralized. As a part of the decentralization process (defined in this study as the shifting of decision-making authority to lower level employees) adaptive units were created to cope with environmental uncertainty. As a result of this process, the business unit manager of larger business unit perceived environmental uncertainty is reduced, which produced the weak relationship between the measure of environmental uncertainty and decentralization observed.

The measure used for perceived task uncertainty was correlated with decentralization, however the coefficient was very small and was found to be not significantly different from zero. No additional insight was found in re-examining Daft and Macintosh (1981) in which the measure was first reported. However, the explanation forwarded for the poor results obtained from the perceived environmental uncertainty measure appear to be appropriate in this context as well. Specifically, the lack of association between perceived task uncertainty and decentralization may reflect that managers of business units which experience high task uncertainty have delegated authority to lower-level managers for many decisions related to these tasks. This delegation process (decentralization) thus

reduces the perceived level of task uncertainty because he/she is no longer directly involved.

Because the measure of budget usefulness was developed for this study and, therefore, had not been previously validated in prior research additional steps were taken to assess its validity. Pursuing the logic of construct validity a number of questions were included in the survey which collected data about the actual use of budgets in each business unit. These questions were included as questions ten through seventeen of section six in the survey instrument. Using a method described in Appendix B the answers to the questions were combined to produce a budget use index.

A Pearson product-moment correlation coefficient was calculated between the budget usefulness scores and the budget use index. A positive coefficient was expected and was obtained ($r = .5071, p = .0001$). This result was interpreted as strong evidence regarding the validity of the budget usefulness measure.

The validity of the performance measure presented the most difficult challenge following the work of Govindarajan (1984) who developed the measure the following evidence is offered. First, from examining the raw data, responses were given across the range of possible answers. In other words, no self-serving bias was observed in the response patterns. Second, similar to the results obtained by Govindarajan, only weak correlation is observed between environmental

uncertainty and the performance measure ($r = .06345$, $p = .5243$). Govindarajan interprets this result as follows:

> The effectiveness measure does not correlate with environmental uncertainty ($r = 0.07$, not significant). This points out that variations in the effectiveness measure are largely due to interorganizational factors (control systems being one of them) rather than due to industry and other environmental factors. (1984, p. 131)

This statement is further substantiated by the higher, albeit weak, correlation observed in this study's data between task uncertainty (an intraorganizational factor) and performance ($r = .12624$, $p = .2039$).

The last piece of evidence related to the validity of the measure is taken from Heneman (1974). Govindarajan (1984) summarizes Heneman's work to indicate that when subordinates were offered anonymity and understand the purpose of the data collection, high positive correlation was observed between superior and self-rated performance measures. Based on all of the evidence cited above there is no *prima facie* evidence of a lack of validity in the performance scores observed. However, because of the nature of the measure it still must be interpreted cautiously.

6.2.5 Summary of the Preliminary Analysis of the Results

A number of different steps were taken to complete a preliminary analysis of the data. The primary purpose of this preliminary analysis was to collect evidence supporting that the data collected was appropriate for use in the primary analysis

-- a test of the contingency model. The univariate statistics provided no evidence that the data could not be used in the primary analysis. The reliability and validity assessments, however, raised several concerns. Specifically, the reliability of the perceived environmental uncertainty measure was not as high as would be desired. Furthermore, both the perceived task and perceived environmental uncertainty measures do not appear to be high in validity. These issues will be given appropriate consideration as the results are interpreted.

6.3   The Primary Analysis of the Results

The primary analysis of the results have been divided into two parts. In the first part hypotheses 1, 2, and 3 will be examined using a reduced version of the empirical model. In the second part hypotheses 4a and 4b will be examined using both the full and reduced empirical models. Because this analysis is based on a relatively small sample (N = 103) and is an exploratory study, and α = .05 level of significance will be used throughout the primary analysis.

6.3.1   Hypotheses 1, 2, and 3
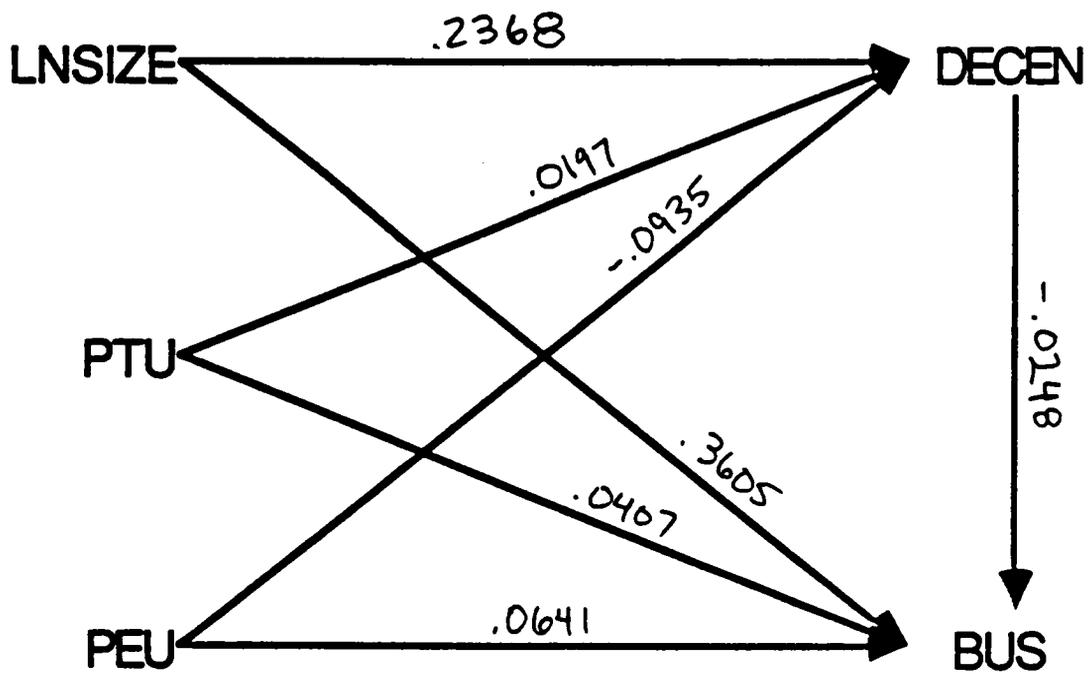
Figure 14. Basic Model

The full empirical model has been reduced by removing performance to simplify and highlight the relationships described in hypotheses 1, 2, and 3. Figure 14 on page 153 includes the direct path coefficients using all 103 observations.[16]

6.3.1.1 Hypothesis 1

As stated in Hypothesis 1 the direct effect between both perceived task and environmental uncertainty and decentralization was expected to be positive. The coefficient between perceived task uncertainty and decentralization is positive, but not significant (b = .0197, p = .4206) whereas the coefficient between perceived environmental uncertainty and decentralization is larger and negative though not significant (b = -.0935, p = .1759). Thus, the results do not generally support Hypothesis 1.

6.3.1.2 Hypothesis 2

As stated in Hypothesis 2 the direct effect between both perceived task and environmental uncertainty and budget system usefulness was expected to be negative. The coefficient between perceived task uncertainty and budget system usefulness however was positive (b = .0407, p = .3327). Similarly, the coefficient between perceived environmental uncertainty and budget system usefulness was also positive (b = .0641, p = .2531). While neither of these

---

[16] The complete GEMINI output listings for all the models examined are provided in Appendix C.

coefficients were significant, they both have the opposite sign of the one expected and provide evidence which does not support Hypothesis 2.

6.3.1.3 · Hypothesis 3

Hypothesis 3 included the prediction that the indirect effects between both perceived task and environmental uncertainty (through decentralization) and budget system usefulness would be positive. The effects shown in Figure 14 on page 153 are only the direct effects. The decomposition of the total effect of both perceived task and environmental uncertainty on budget system usefulness into their direct and indirect components is contained in Table 8. As can be seen from the table both direct effects are extremely small and neither are statistically significant. These results do not support Hypothesis 3.

6.3.2 Hypotheses 4a and 4b

Proposition 4 was split into Hypotheses 4a and 4b because two different methods were proposed to examine this proposition. Hypothesis 4a will be examined first followed by Hypothesis 4b.

6.3.2.1 Hypothesis 4a

| Table 8. | Decomposition of the Total Effects of Both PTU and PEU on BUS |

	PTU->BUS	PEU->BUS
Direct effect	0.0407	0.0641
Indirect effects	-0.0005*	0.0023**
Total effect	0.0402	0.0664

* p = .4371
** p = .4017
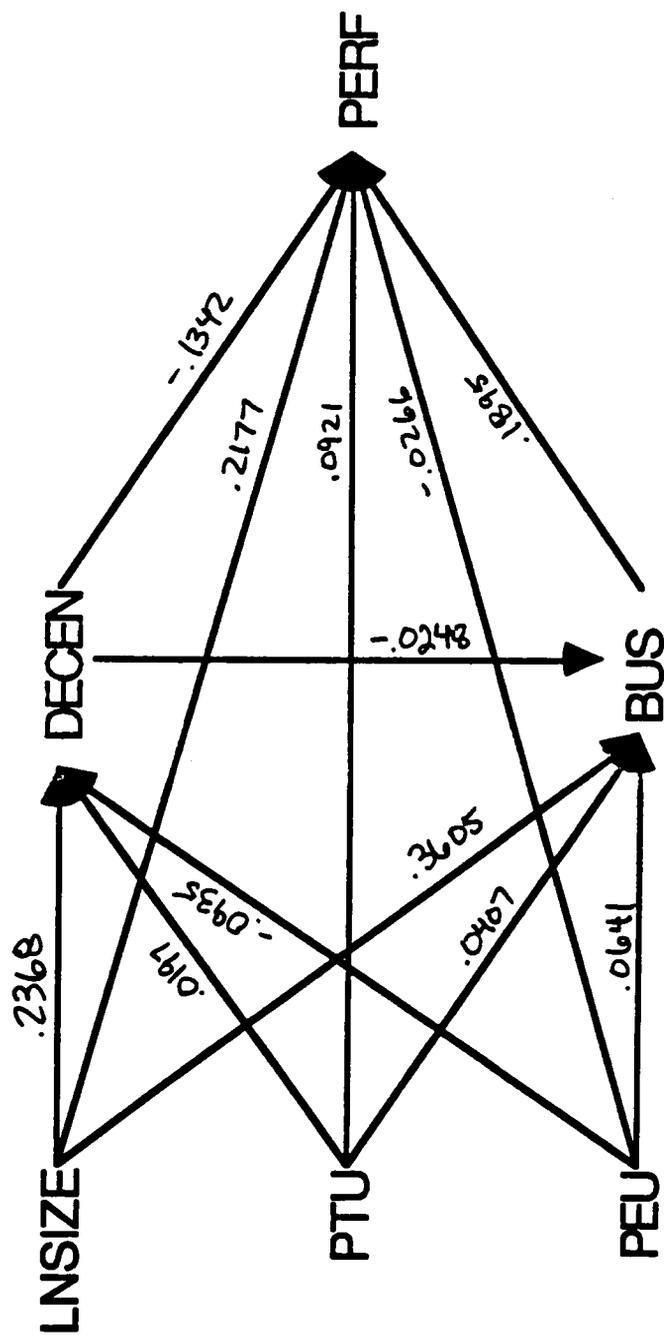
Figure 15. Full Model

Table 9. Decomposition of the Total Effects of Both PTU and PEU on PERF		
	PTU->PERF	PEU->PERF
Direct effect	0.0921	-0.0266
Indirect effects	0.0050*	0.0251**
Total effect	0.0971	-0.0015

* p = .4143
** p = .1625

As stated in Hypothesis 4a the indirect effects between both perceived task and environmental uncertainty (through both decentralization and budget system usefulness) and performance are expected to be positive. The full empirical model is displayed in Figure 15 on page 157. This figure includes the direct effects. The decomposition of the total effect of the two uncertainty measures into their direct and indirect components is presented in Table 9 on page 158.

Both indirect effects are in the hypothesized direction. While the indirect effect of perceived task uncertainty is very small the indirect effect for perceived environmental uncertainty is much larger. Therefore the results support Hypothesis 4a weakly, with much stronger evidence for the indirect effect of perceived environmental uncertainty through decentralization and budget system usefulness on performance than for perceived task uncertainty.

6.3.2.2 Hypothesis 4b

Hypothesis 4b states that the direct and indirect effects between both perceived task and environmental uncertainty and both decentralization and budget system usefulness will be larger in absolute value for high performance firms than for low performance firms. This hypothesis relates to the same general question as Hypothesis 4a, but examines this question in a different manner.

To examine Hypothesis 4b the data was first split at median performance. Using the split data two separate path models (reduced version) were examined. The
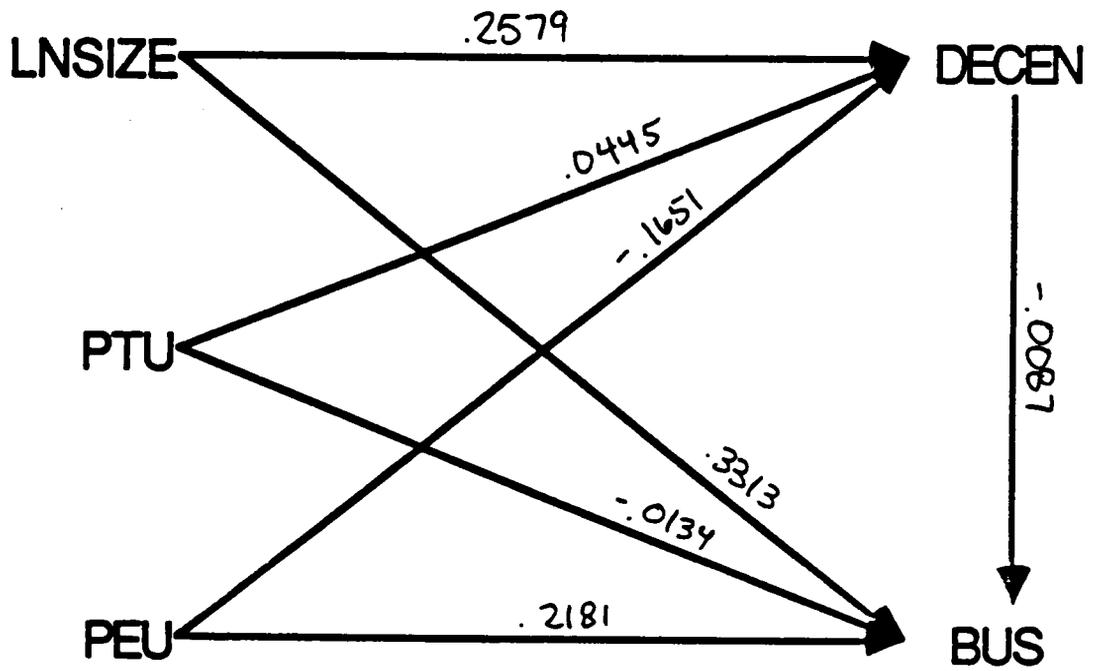
Figure 16.   Basic Model - Low Performance Group
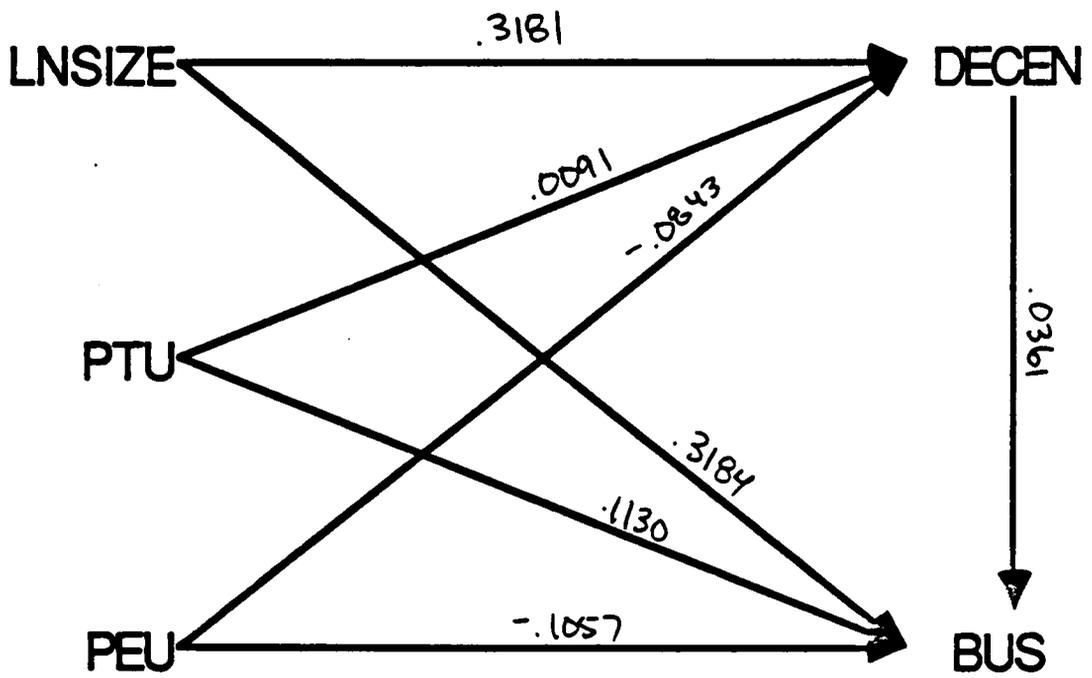
Figure 17. Basic Model - High Performance Group

Table 10. Decomposition of the Total Effects - Split Data		
Direct effects	**Low PERF group**	**High PERF group**
PTU- > DECEN	0.0445 (p = .3763)	0.0091 (p = .4685)
PEU- > DECEN	-0.1651 (p = .8719)	-0.0843 (p = .8378)
PTU- > BUS	-0.0134 (p = .4596)	0.1130 (p = .7881)
PEU- > BUS	0.2181 (p = .9427)	-0.1057 (p = .2325)
Indirect effects		
PTU- > DECEN- > BUS	-0.0004 (p = .5253)	0.0004 p = .4751
PEU- > DECEN- > BUS	0.0014 (p = .4748)	-0.0030 p = .5894

results obtained are presented in Figure 16 on page 160 and Figure 17 on page 161 and in Table 10 on page 162.

From the two figures and the two models, the following observations may be made. First, the direct effects of both perceived task and environmental uncertainty on decentralization do not support Hypothesis 4b. While the path coefficients for both the low and high performance group are in the expected direction (positive), the low performance group's coefficient is actually larger (b (low) = 0.0445, b (high) = 0.0091). Similarly, the coefficient between perceived environmental uncertainty and decentralization (b (low) = -0.1651) is almost twice as large as the high performance group (b (high) = -0.0843).

Mixed results are observed between the direct effects of the two perceived uncertainty measures and budget usefulness. The direct path coefficient between perceived task uncertainty and budget system usefulness for the high performance group (b (high) = 0.1130) is larger, than the same coefficient for the low performance group (b (low) = -0.0134), but this coefficient is actually in the opposite direction from the expected result. The reverse is true for the coefficients between perceived environmental uncertainty and budget system usefulness. In this case the low performance group's coefficient is larger (b (low) = 0.2181) than the high performance group (b (high) = -0.1057) but is in the opposite direction.

Lastly, consider the indirect effects. Just as in the models using the full data set, the indirect coefficients from the split data are all small. The indirect effect of

perceived task uncertainty (through decentralization) on budget system usefulness is the same in size for both the low and high performance groups (b = 0.0004 for both groups). The difference is that a negative indirect effect was observed in the low performance data whereas a positive indirect effect was observed in the high performance data. Alternatively, the indirect effect involving perceived environmental uncertainty showed some slight difference. The low performance group's coefficient was in the expected direction (b (low) = 0.0014) but is smaller than the high performance group's coefficient (b (high) = -0.0030).

To summarize the data does not provide strong support for Hypothesis 4b. In several cases different coefficients were observed between the two groups, but these differences were not in the expected direction.

6.3.3 Discussion and Interpretation of the Research Results

The results presented in the primary analysis of the data do not support the theoretical model. The objective of this section is to present a discussion and interpretation of the results which were obtained. Following the pattern of the previous section, this discussion will be organized around the research hypotheses.

6.3.3.1 Discussion and Interpretation of Hypothesis 1

While Hypothesis 1 predicted a significant positive effect between each of the perceived uncertainty variables and decentralization, both effects observed were not significant, with the larger of the two which involved perceived environmental uncertainty being negative. A number of plausible explanations are possible for these results. These explanations may be divided along theoretical and methodological lines. The theoretical explanations will be addressed first.

First, and perhaps most simply, the theory may be incorrect. It is possible that the level of decentralization chosen by a firm is not affected significantly by the level of uncertainty present in the firm's environment or inherent in the task performed by the firm. However, as was reviewed in the model development chapter, a number of empirical observations have supported these relationships.[17] Therefore, this explanation cannot be quickly accepted.

Second, turning to methodological explanations, certainly the sample size limited the possibility of finding statistically significant relationships. While over 100 observations were collected, this sample size is only sufficient to detect reasonably strong relationships.

Third, and most likely, it is possible that the operationalization and measurement methods selected limited the potential to observe the predicted relationships.

---

[17] See section 6.2.4.2 for this discussion.

Specifically, with hindsight it appears that the choice of using perceptual measures for both task and environmental uncertainty restricted the opportunity to perform an optimal test for the model. Because this explanation appears to be the most satisfying it will be explored further.

The rationale for using perceptual measures for both task and environmental uncertainty was that previously developed instruments were available and these instruments could reasonably be completed by the business unit manager. This choice avoided the problem of requiring multiple respondents per business unit, which would have drastically reduced the obtainable sample.

The result of this choice appears to be as follows. The theory stated that business units would, in the face of increasing levels of environmental and task uncertainty, shift decision-making authority to lower-level members of their unit. While this choice would increase decentralization it would also decrease the *perceived* uncertainty for the business unit manager or possibly the manager's perception of control over his/her environment. Once the unit had decentralized, the manager's perceived uncertainty would be reduced. Of the possible explanations which have been presented, this one seems to be the most likely.

6.3.3.2 Discussion and Interpretation of Hypothesis 2

Similar to Hypothesis 1, the results of Hypothesis 2 did not confirm the theory. While a negative direct effect between the two sources of uncertainty was

expected, weak positive effects were observed. Just as in the case of Hypothesis 1, it is possible that the expected relationship is not correct, however it is also possible that the use of perceptual uncertainty measures affected the results.

The explanation is similar to that provided for Hypothesis 1. It is plausible that units facing higher levels of uncertainty in their environments and tasks would develop and use target and goal setting systems such as budgets. As a result of this process, however the business unit manager may actually perceive less uncertainty. For example, suppose a software development unit initially developed applications for the IBM-PC and compatible market. However, as a result of the growth in the popularity of the Apple Macintosh a decision is made to also develop products for this market as well. The result of this decision is an increase in task and environmental uncertainty for the unit due to multiple development platforms and multiple distribution channels and markets. However, the unit may structurally adopt by breaking itself into two development groups, one for each market. Each of the two development groups could be given development budgets and be expected to achieve target levels of market share and profit. Notice what has occurred as a result of these changes. The business unit manager who was once in charge of the single development group is now responsible for the two groups, which he/she now manages by using budgetary goals and constraints. Indeed, in this scenario it is possible that perceived increases in task and environmental uncertainty could lead to higher levels of budget usefulness rather than lower levels as initially predicted. While the actual

results do not confirm this explanation, because they are not statistically significant, they do support it.

6.3.3.3   Discussion and Interpretation of Hypothesis 3

Given the weakness of the results from Hypotheses 1 and 2 it was not surprising that little evidence was found to support Hypothesis 3. Positive indirect effects were expected from both sources of uncertainty operating through decentralization to budget system usefulness. The actual indirect effects observed were both very small (< 0.01) and not statistically significant. An extremely weak negative indirect effect was observed for perceived task uncertainty (-0.0005) and a slightly larger, but still small, positive effect for perceived environmental uncertainty (0.0024).

Due to both the insignificance of the indirect effects observed and to the measurement problems discussed above, it does not seem fruitful to attempt any further explanation. What can be said is that no indirect effects were observed, but that weaknesses in the measurement method is at least as plausible an explanation as the theory itself proving to be incorrect.

6.3.3.4   Discussion and Interpretation of Hypothesis 4a

Hypothesis 4a is based upon the full path model which included, in addition to the variables previously discussed, a measure for performance. The expectation

was that the indirect effects between both perceived task and environmental uncertainty would be positive. This result would indicate that those firms which had properly matched their levels of decentralization and usefulness of budgets to their tasks and environments were performing at a higher level than those who did not.

While both indirect coefficients were observed to be positive, neither were significant. The larger of the two indirect coefficients was between environmental uncertainty and performance. This coefficient is also interesting because it is almost identical too, but in an opposite direction from, the direct coefficient. The direct coefficient between perceived environmental uncertainty performance was -0.0266, whereas the indirect effects coefficient was 0.0251. This result lends further support to the interpretations provided for the first three hypotheses. It appears that business unit managers who perceived higher levels of uncertainty do so because they have not adopted correct levels of decentralization and budget usefulness. This results in lower performance for their unit (the direct effect). Those units which have successfully adapted to their environments and tasks apparently were able to achieve higher levels of performance (the indirect effect). Due to the size and lack of significance of these coefficients this explanation should be considered as tentative at best.

The results involving perceived task uncertainty are somewhat different. First the indirect effect is very small (0.0050) and offers no support to the proposed theory.

The direct effect, however, is much larger (0.0971). Regardless of this fact, this effect is not consistent with Hypothesis 4a.

6.3.3.5   Discussion and Interpretation of Hypothesis 4b

The method used to examine Hypothesis 4b provides a clearer insight into the questions addressed by Hypothesis 4a. Hypothesis 4b was examined by splitting the data into two groups at median performance. The coefficients of the two models did not generally conform to the expectations but they do offer some insight into the relationships examined.

First, consider the direct relationships between perceived task and environmental uncertainty and decentralization. The coefficients between perceived task uncertainty and decentralization are small and positive for both groups, but the low performance group's coefficient is larger (0.0445 compared to 0.0091). However, the coefficients between perceived environmental uncertainty and decentralization are larger for the low performance group (-0.1651) than for the high performance group (-0.0843).

Following the explanation developed earlier for Hypothesis 1, it appears that the business units in the low performance group have not adequately adjusted to their present level of environmental uncertainty. Thus members of the low performance group who perceive high levels of environmental uncertainty are in less decentralized units.

Next, the direct effects between perceived task and environmental uncertainty

and budget system usefulness. Once again observable differences exist between

the two groups. First, for the high performance group the direct effect between

perceived task uncertainty is 0.1130 whereas the direct effect between perceived

environmental uncertainty is -0.1057. Apparently for the high performance

group increased levels of task uncertainty are compensated for by increased levels

of budget use. On the other hand increased levels of environmental uncertainty

are associated with decreased levels of budget usefulness. It is interesting that

uncertainty emanating from within the unit is adjusted for by increased budget

usefulness whereas uncertainty from outside the unit results in decreased reliance.

For the low performance group, the opposite relationships were observed. Lower

levels of perceived task uncertainty were weak by related to higher usefulness of

budgets (-0.0139) and higher levels of environmental uncertainty were associated

with higher levels of budget usefulness (0.2181). Apparently units in this group

when faced with uncertainty environments rely on their budgets to their

detriment.

Lastly, the indirect effects between perceived task and environmental uncertainty

and budget system usefulness. Little insight is gained from the examination of

these indirect effects. Just as in the with the full data set, all of the indirect

relationships are extremely small and not statistically significant.

6.4   Discussion and Analysis of the Control Variable Size

Before summarizing the research results and concluding the chapter, several comments need to be made about the variable size. As indicated in Chapter 5, this variable was inserted into the empirical model as a control variable and not as an additional explanatory variable. As a result, within the context of the theory being tested, no meaning can be assigned to the path coefficients between size and the other variables.

However, as can be observed in the actual results obtained, size is strongly associated with several of the variables measured. In fact, the path coefficients between size and the the endogenous variables dwarf the coefficients between the uncertainty variable the endogenous variables. These results suggest that in future versions of the model size should be considered as a candidate for inclusion, assuming that sound theoretical arguments may be made for its effects.

6.5   Summary of the Research Results

The purpose of this chapter was to analyze the results of an empirical test of the model of budget system usefulness developed in this dissertation. The preliminary analysis indicated that 181 responses were received to the questionnaire resulting in an overall response rate of close to 49%. Furthermore,

a univariate analysis of the data revealed no evidence that the data could not be used to test the model.

However, an unexpected result was obtained in assessing the reliability and validity of the data. While the measurement methods selected for each of the variables appeared to be reliable, the validity of the perceived task and environmental uncertainty measures was questioned. Specifically it appeared that the perceptual measures of task and environmental uncertainty chosen were not related to decentralization in the manner that was expected. An explanation for the relationship observed was provided.

The primary analysis did not yield strong support for the model. Several alternative explanations for the lack of support were explored. Lastly an interpretation of the results obtained was offered.

Chapter 7

Limitations, Contributions, Conclusions and Extensions

7.1 Introduction

This final chapter contains a collection of distinct sections which draw together

the research process reported in this dissertation. The first section contains a

number of limitations of the project and describes how these limitations were

mitigated and how they affected the results obtained. The second section includes

a description of the contributions which have been made by this project. The

conclusions which may be drawn from this project form the third section. The

final section of this chapter includes a proposal for several directions which could

be pursued to extend the work begun in this project.

7.2   Limitations of the Research

Because research is conducted in an environment of scarce resources limitations are a part of every project. The most significant limitations present in this research project will be included in this section.

First, because the data were not collected from a random sample of business units, the results are not readily generalizable to some larger population such as all U.S. business units. The possibility that any results observed are simply an artifact of the sample can never be eliminated. However, as was noted in the prior chapter, the demographic characteristics of the respondents and their business units do not indicate any significant observable bias in the sample.

Second, the results obtained rely primarily on perceptual data collected from a single business unit member. The effects of using perceptual measures, particularly for task and environmental uncertainty were discussed at length in the previous chapter. A similar limitation is the use of only one respondent per business unit. It is possible that combining perceptual responses from a number of members of the business unit could have reduced the apparent bias introduced by using the perceptions of the business unit manager.

The third, and final, limitation is that because the results did not confirm to the expectations derived from the theory, any explanations offered for the results

obtained must be viewed as tentative. In one sense, the explanations should be considered as new, untested hypotheses.

7.3 Contributions of the Research

While the research results did not conform to the expectations derived from theory this does not imply that the research is without important contributions. The research provided the following contributions.

First, while a number of authors had proposed that Galbraith's contingency theory of organizational structure would provide a suitable basis for management accounting system research, no known work had explored this possibility. As a part of this research effort, a theoretical model of budget system usefulness was derived from Galbraith's theory and from the extensions made by Tushman and Nadler. This model, relying on the unifying constructs of uncertainty and information processing, provides a conceptual basis for empirical research. Furthermore, this model was operationalized into an empirical model which can be used in future research projects.

Second, an empirical examination of the model was performed. While there were many limitations and weaknesses of this test, as have been described in the previous section and the previous chapter, the empirical test performed stand as one collection of evidence related to the theory and model which were developed.

Third, an instrument to measure budget system usefulness was constructed and used in this project. This instrument appears to measure with high reliability and reasonable validity an interesting and important management accounting system variable. Furthermore this instrument is usable in both service and manufacturing environments. This instrument should be useful in future projects investigating budget related questions.

Fourth, the study contributed additional insight into the fit-effectiveness hypothesis. While many other studies have ignored this critical question, it was addressed in the present context. It does appear that the usefulness of budgets and performance are related. The explication of the nature of this relationship will await further research.

7.4   Conclusions

The conclusions which may be drawn from this research are most clear when the initial objectives of the project are considered. The initial objectives of this research project were summarized in four interdependent questions:

1. Can a suitable theory be identified which will provide a basis for empirical research of management accounting systems following a contingency approach?
2. Can this theory be tested?
3. Will this theory be supported by the empirical results?
4. What are the implications for this theory for future research and for future management accounting practice?

Each question will be reviewed in turn.

The answer to the first question is that the contingency theory of Galbraith does appear to provide a suitable basis for empirical research into management accounting systems. This theory is developed around the notions of uncertainty and information processing and, unlike many other theories from the organizational literature has direct implications for management accounting system design and use. At this stage of development, a major missing element is the integration of the impact of the size of an organization. Such an integration does not seem incompatible with the theory, but rather only a missing component.

The second question was related to whether the theory could be empirically verified. Regardless of a theory's conceptual clarity it must be empirically verifiable. The answer to this question, based on the research effort reported herein, is that while it is feasible to test the theory, a complete test has not yet been constructed. The primary difficulties at this point are first in the area of the operationalization and measurement of several key constructs in the theory including, but not limited to, uncertainty and effectiveness. Most obvious from the results obtained in this dissertation are that perceptual measure are not sufficient to provide an adequate test. Future efforts should be directed towards development and validation of uncertainty measures which are compatible with the theory.

Questions three and four must await future research for final resolution. However, this project has provided some limited insight into these questions. The empirical results, while tainted by small sample size and crude measurement methods do indicate that the variables proposed by the theory are associated in an interdependent and complex fashion. Of particular significance are the results which indicated that the variables were related in quite different manners when the data was split based on performance.

7.5   *Extensions of the Research*

Several extensions of this research project may be proposed. The first and most obvious extension would be to restate the theory including a construct for size. Secondly the theory, in restated form, could be reexamined, attempting to use non-perceptual measures for uncertainty and alternative effectiveness measures. While it is possible that another large-sample, survey-based test could be performed, a more practical suggestion would be to explore the possibility of a test developed around a small-sample field study methodology. Such direction has been proposed by a variety of researchers including Otley (1980) and Kaplan (1986).

On a somewhat different tack, the budget usefulness measure developed and validated in this study could be used in other contexts. For example, the measure

could be used to explore if whether managers of similar profit centers, such as branch banks, find budgets to be more or less useful and if differences in budget usefulness can be related to differences in performance in their units.

7.6 Summary

This dissertation set out with the ambitious dual goal of identifying and empirically testing a contingency theory of management accounting systems. A review of both the theoretical and empirical literature revealed that weaknesses in extent theories had lead to a number of theoretical empirical projects. Based on suggestions found in the literature Galbraith's contingency theory of organization structure was examined and from this theory and several extensions found in the organizational literature a contingency theory of budget usefulness was proposed.

An empirical test of this theory was performed with the results generally not supporting the theory. However, this lack of support was partially attributable to weaknesses of several measurement methods chosen. While the results did not provide a strong test of the theory proposed they did reveal several interesting relationships. Specifically, there was a difference in the relationships between the uncertainty variables and the structural variables, when the performance of the

units was included. This finding supports further investigation of the fit-effectiveness hypothesis.

Bibliography

Abdallah, W.M. & D.E. Keller, "Measuring the Multinational's Performance," *Management Accounting*, Vol. 67, No. 4 (December 1985), pp. 26-30, 56.

Anthony, R.N. & J. Dearden, *Management Control Systems*, Homewood, IL: Richard D. Irwin, Inc., 1980.

Banbury J. & J.E. Nahapiet, "Towards a Framework for the Study of the Antecedents and Consequences of Information Systems in Organizations," *Accounting, Organizations and Society*, Vol. 4, No. 3 (1979), pp. 163-177.

Barrett, M.E. & L.R. Fraser, "Conflicting Roles in the Budgeting for Operations," *Harvard Business Review*, July-August 1977, pp. 137-146.

Brownell, P., "Participation in the Budgeting Process: When it works and When it Doesn't," *Journal of Accounting Literature*, Vol. 1 (1982), pp. 125-153.

Bruns, W.J. & J.H. Waterhouse, "Budgetary Control and Organizational Structure," *Journal of Accounting Research*, Vol. 13 No. 2 (Autumn 1975), pp. 177-203.

Burns, T. & G.M. Stalker, *The Management of Innovations*, London: Tavistock, 1961.

Carmines, E.G. & R.A. Zeller, *Reliability and Validity Assessment*, Beverly Hills, CA: Sage Publications, 1979.

Chenhall, K.A. & D. Morris, "The Impact of Structure, Environment, and Interdependence of the Perceived Usefulness of Management Accounting

Systems," *The Accounting Review*, Vol. 56 No. 1 (January 1986), pp. 16-35.

Child, J., *Organization: A Guide to Problems and Practice*, New York: Harper and Row, 1977.

Cooper, D., "A Social and Organizational View of Management Accounting" from *Essays in British Accounting Research*, Edited by M. Bromwich and A. Hopwood., London: Pittman, 1961.

Cress, W.P. & J.B. Pettijohn, "A Survey of Budget-Related Planning and Control Policies and Procedures," *Journal of Accounting Education*, Vol. 3, No. 2 (Fall 1985), pp. 61-78.

Daft, R.L. & N.B. Macintosh, "A Tentative Exploration into the Amount and Equivocality of Information Processing in Organizational Work Units," *Administrative Science Quarterly*, Vol. 26 (June 1981), pp. 207-224.

Dillman, D.A., *Mail and Telephone Surveys*, New York: John Wiley & Sons, 1978.

Dillon, W.R. & M. Goldstein, *Multivariate Analysis*, New York: John Wiley & Sons, 1984.

Donaldson, L. *In Defence of Organization Theory: A Reply to the Critics*, London: Cambridge University Press, 1985.

Downey, H., D. Hellriegel, & J. Slocum, "Environmental Uncertainty: The Construct and Its Application," *Administrative Science Quarterly*, Vol. 20, No. 4 (December 1975), pp. 613-629.

Downey, H.K. & J.W. Slocum, "Uncertainty Measures, Research, and Sources of Variation," *Academy of Management Journal*, Vol. 18, No. 3 (September 1975), pp. 562-577.

Duncan, R.B., "Characteristics of Organizational Environments and Perceived Environmental Uncertainty," *Administrative Science Quarterly*, Vol. 17 (September 1972), pp. 313-327.

Emmanuel, C.R. & D.T. Otley, *Accounting for Management Control*, Berkshire, England: Van Nostrand Reinhold Co. Ltd., 1985.

Engelhoff, W.G., "Strategy and Structure in Multinational Corporations: An Information Processing Perspective," *Administrative Science Quarterly*, Vol. 27 (September 1982), pp. 435-458.

Fertakis, J. P., *Budget-Induced Pressure and Its Relationship to Supervisory Behavior in Selected Organizations*, Unpublished doctoral dissertation: University of Washington, 1967.

Flamholtz, E.G., "Accounting, Budgeting and Control Systems in their Organizational Context: Theoretical and Empirical Perspectives," *Accounting, Organizations and Society*, Vol. 8 No. 2/3 (1983), pp. 153- 169.

Flamholtz, E.G., T.K. Das, & A.S. Tsui, "Towards an Integrative Framework of Organizational Control," *Accounting, Organizations and Society*, Vol. 10 No. 1 (1985), pp. 35-50.

Fry, L.W., "Technology-Structure Research: Three Critical Issues," *Academy of Management Journal*, Vol. 25 No. 3 (1982), pp. 532-553.

Galbraith, J., "Organization Design: An Information Processing Perspective," Working paper #425-69, Cambridge, MA: MIT, Sloan School of Management, 1969.

Galbraith, J., *Designing Complex Organizations*, Reading, MA: Addison-Wesley Publishing Company, 1973.

Galbraith, J., *Organizational Design*, Reading, MA: Addison-Wesley Publishing Company, 1977.

Gerwin, D., "The Comparative Analysis of Structure and Technology: A Critical Appraisal," *Academy of Management Review*, Vol. 4, No. 1 (1979), pp. 41-51.

Gillespie, D.F. & D.S. Mileti, "Technology and the Study of Organizations: An Overview and Appraisal," *Academy of Management Review*, Vol. 2, No. 1 (1977), pp. 7-16.

Gordon, L.A. & D. Miller, "A Contingency Framework for the Design of Accounting Information Systems," *Accounting, Organizations and Society*, Vol. 1 No. 1 (1976), pp. 59-69.

Gordon, L.A. & V.K. Narayanan, "Management Accounting Systems, Perceived Environmental Uncertainty and Organizational Structure: An Empirical Investigation," *Accounting, Organizations and Society*, Vol. 9 No. 1 (1984), pp. 33-47.

Govindarajan, V., "Appropriateness of Accounting Data in Performance Evaluation: An Empirical Examination of Environmental Uncertainty as an Intervening Variable," *Accounting, Organizations and Society*, Vol. 9 No. 2 (1984), pp. 125-135.

Govindarajan, V. & A.K. Gupta, "Linking Control Systems to Business Unit Strategy: Impact on Performance," *Accounting, Organizations and Society*, Vol. 10, No. 1 (1985) pp. 51-66.

Hackman, J.R., Preface to *Causal Analysis*, by L.R. James, S.A. Muliak, & J.M. Brett, Beverly Hills, CA: Sage Publications, Inc., 1982.

Hayes, D.C., "The Contingency Theory of Management Accounting," *The Accounting Review*, Vol. 52, No. 1 (January 1977), pp. 22-39.

Hayes, D. C., "The Contingency Theory of Management Accounting: A Reply," *The Accounting Review*, Vol. 53, No. 2 (April 1978), pp. 530-533.

Hirst, M.K., "The Effect of Setting Budget Goals and Task Uncertainty on Performance: A Theoretical Analysis," *The Accounting Review*, Vol. 62 No. 4, (October 1987), pp. 774-784.

Hofstede, G., *The Game of Budget Control*, London: Tavistock, 1968.

Hopwood, A., "The Path Ahead," *Accounting, Organizations and Society*, Vol. 1, No. 1 (1976), pp. 1-4.

Imhoff, E.A., "Management Accounting Techniques: A Survey," *Management Accounting*, Vol. 60, No. 5 (November 1978), pp. 41-45.

Johnson, H.T. & R.S. Kaplan, *Relevance Lost: The Rise and Fall of Management Accounting*, Boston, MA: Harvard Business School Press, 1987.

Kaplan, R.S., "The Role of Empirical Research in Acounting," *Accounting, Organizations and Society*, Vol. 11, No. 4/5 (1986), pp. 429-452.

Kast, F.E. & J.E. Rosenzweig, *Contingency Views of Organization and Management*, Chicago: Science Research Associates, 1973.

Kenny, D.A., *Correlation and Causality*, New York: John Wiley & Sons, 1979.

Kerlinger, F.N., *Foundations of Behavioral Research*, 2nd ed., New York: Holt, Rinehart & Winston, 1973.

Khandwalla, P., "The Effect of Different Types of Competition on the Use of Managment Controls," *Journal of Accounting Research*, Autumn 1972, pp. 275-285.

Khandwalla, P., *The Design of Organizations*, New York: Harcourt, Brace, Jovanovich, 1977.

Kimberly, J.R., "Organizational Size and the Structuralist Perspective: A Review, Critique, and Proposal," *Administrative Science Quarterly*, Vol. 21 (December 1976), pp. 571-597.

Khandwalla, P.N., "The Effects of Different Types of Competition on the Use of Management Controls," *Journal of Accounting Research*, Autumn 1972, pp. 275-285.

Lawrence, P.R. & J.W. Lorsch, *Organization and Environment*, Homewood, IL: Irwin, 1967.

Lincoln, Y.S. & E.G. Guba, *Naturalistic Inquiry*, Beverly Hills, CA: SAGE Publications Inc., 1985.

Lowe, E.A., "On the Idea of a Management Control System: Integrating Accounting Management Control," *The Journal of Management Studies*, Vol. 8, No. 1 (February 1971), pp. 1-12.

Lowe, E.A. & J.M. McInnes, "Control in Socio-Economic Organizations: A Rationale of the Design of Management Control Systems (Section I)," *The Journal of Management Studies*, Vol. 8, No. 2 (May 1971), pp. 213-227.

Maciariello, J.A., *Management Control Systems*, Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984.

Merchant, K.A., *Deparmental Budgeting: An Empirical Examinination of a Contingency Model,* Unpublished doctoral dissertation, The University of California at Berkeley, 1978.

Merchant, K.A., "The Design of the Corporate Budgeting System: Influences on Managerial Behavior and Performance," *The Accounting Review*, Vol. 56 No. 4 (October 1981), pp. 813-829.

Merchant, K.A., "Influences on Departmental Budgeting: An Empirical Investigation of a Contingency Model," *Accounting, Organizations and Society*, Vol. 9 No. 3/4 (1984), pp. 291-307.

Miles, R.E. & C.C. Snow, *Organizational Strategy, Structure, and Process*, New York: McGraw-Hill Book Co., 1978.

Miller, D. & C. Droge, "Psychological and Traditional Determinants of Structure," *Administrative Science Quarterly*, Vol. 31 (December 1986), pp. 539-560.

Morgan, G., *Images of Organization* Beverly Hills, CA: Sage Publications, Inc., 1986. Neave, H.R., *Statistical Tables*, London: George Allen & Unwin, 1978.

Nunnally, J.C., *Psychometric Theory*, New York: McGraw-Hill, Inc., 1967.

Otley, D.T., "The Contingency Theory of Management Accounting: Achievement and Prognosis," *Accounting, Organizations and Society*, Vol. 5 No. 4 (1980), pp. 413-428.

Ouchi, W., "The Relationship Between Organizational Structure and Organizational Control," *Administrative Science Quarterly,* 1977, pp. 95-113.

Pugh, D.S., D.J. Hickson, C.R. Hinings, & C. Turner, "The Context of Organizational Structures," *Administrative Science Quarterly*, Vol. 14 (1969), pp. 91-114.

Pugh, D.S., D.J. Hickson, & C. Turner, "Dimensions of Organizational Structure," *Administrative Science Quarterly*, Vol. 13 (1968), pp. 65-105.

Reimann, B.C., "Dimensions of Organizational Technology and Structure: An Exploratory Study," *Human Relations*, Vol. 30, No. 6 (1977), pp. 545-566.

Reimann, B.C. & G. Inzerilli, "A Comparative Analysis of Empirical Research on Technology and Structure," *Journal of Management*, Vol. 5 No. 2 (1979), pp. 167-192.

Rockness, H.O. & M. D. Shields, "Organizational Control Systems in Research and Development," *Accounting, Organizations and Society*, Vol. 9, No. 2 (1984), pp. 165- 177.

Rosenzweig, K., "An Exploratory Field Study Between the Controller's Department and Overall Organizational Characteristics," *Accounting, Organizations and Society*, Vol. 6, No 4 (1981), pp. 339-354.

SAS Institute, Inc., *SAS User's Guide: Basics Version 5 Edition*, Cary, NC: SAS Institute, Inc., 1985.

Sathe, V., "The Relevance of Modern Accounting Theory for Managerial Accounting," *Accounting, Organizations and Society*, Vol. 3 No. 1 (1978), pp. 89-92.

Sathe, V., "Contingency Theories of Organizational Structure," in Livingstone, J.L. (ed.), *Managerial Accounting: the Behavioral Foundations*, Columbus, OH: Grid, 1975.

Sathe, V., *Structural Adaptation to Environment: Study of Insurance Company Departments and Branch Banks*, Unpublished Ph.D. dissertation, The Ohio State University, 1974.

Steers, R.M., *Organizational Effectiveness: A Behavioral View*, Pacific Palasades, CA: Goodyear Publishing Company, 1977.

Steers, R.M., "Problems in the Measurement of Organizational Effectiveness," *Administrative Science Quarterly*, Vol. 20 No. 4 (December 1975), pp. 546-558.

Swieringa, R. J. and R. H. Moncur, *Some Effects of Participative Budgeting on Managerial Behavior*, NY: National Association of Accountants, 1975.

Tannenbaum, A. S., *Control in Organizations*, McGraw-Hill, 1968.

Taylor, F. W. *Principles of Scientific Management*, New York: Harper & Row, 1911.

Thomas, A. P., "The Contingency Theory of Corporate Reporting: Some Empirical Evidence," *Accounting, Organizations and Society*, Vol. 11 No. 3, (1986), pp. 253-270.

Thompson, J.D., *Organizations in Action*, New York: McGraw-Hill, 1967.

Tiessen, P. and J. H. Waterhouse, "The Contingency Theory of Management Accounting: A Comment," *The Accounting Review*, Vol. 53, No. 2 (April 1978), pp. 523-529.

Tiessen, P. & J.H. Waterhouse, "The Contingency Theory of Management Accounting: A Comment," *The Accounting Review*, April 1978, pp. 523-529.

Tosi, H., R. Aldag, & R. Storey, "On the Measurement of the Environment: An Assessment of the Lawrence and Lorsch Environmental Uncertainty Questionnaire," *Administrative Science Quarterly*, Vol. 18, No. 1 (March 1973), pp. 27-37.

Tushman, M.L. & D.A. Nadler, "Information Processing as an Integrating Concept in Organizational Design," *Academy of Management Review*, Vol. 3 No. 3 (July 1978), pp. 613-624.

Van de Ven, A. H. & A. L. Delberg, "A Task Contingent Model of Work-Unit Structure," *Administrative Science Quarterly*, Vol. 19 (1979), pp. 183-197.

von Bertalanffy, L. *General Systems Theory: Foundations, Development, Applications*, New York: Braziller, 1968.

Waterhouse, J.H., & P. Tiessen, "A Contingency Framework for Management Accounting Systems Research," *Accounting, Organizations and Society*, Vol. 3 No. 1 (1978), pp. 65-76.

Watson, D.J.H., "Contingency Formulations of Organizational Structure: Implications for Management Accounting," in Livingstone, J.L. (ed.), *Managerial Accounting: the Behavioral Foundations*, Columbus, OH: Grid, 1975.

Weick, K.A., *The Social Psychology of Organizing*, Reading, MA: Addison-Wesley, 1969.

Wolfle, L. M. & C.A. Ethington, "GEMINI: Program for Analysis of Structural Equations with Standard Errors of Indirect Effects," *Behavior Research Methods, Instruments, & Computers*, Vol. 17 (1985), pp. 581-584.

Woodward, J., *Industrial Organisation: Theory and Practice*, London: Oxford University Press, 1965.

Yin, R.K., *Case Study Researcg: Design and Methods*, Beverly Hills, CA: Sage Publications, Inc., 1984.

Appendix A

Questionnaire

This appendix contains a copy of the questionnaire use in this study. The original sources of the questions in each section are as follows:

Section	Source
1	Daft and Macintosh (1981)
2	Miles and Snow (1978)
3	Pugh, Hickson, Hinnings, and Turner (1968)
4	Developed by researcher
5	Govindarajan (1984)
6	Developed by researcher

The final page of this section is the cover letter included with the questionnaire.

A Study
of the
Usefulness of Budgets

The R.B. Pamplin College of Business
Department of Accounting

Virginia Tech
Blacksburg, Virginia

April 20, 1988

General Instructions

The following survey is designed to investigate several factors which are believed to affect the usefulness of budgets. Because this survey will be completed by people who work in different companies, the phrase *business unit* or *unit* will be used in many questions. The terms business unit and unit will be used to refer to the division, subsidiary, group, or department you are responsible for. Answer all of the questions from the perspective of your unit.

The survey is divided into six short sections. The questions in each section are about some particular aspect of your unit. For example, Section 2 contains questions about the environment your unit operates in. You will be given specific instructions at the beginning of each section. To make the questionnaire easy to complete, each section begins on a new page.

Please complete the survey carefully. It should take you less than half an hour to complete the whole survey. Please answer *all* the questions, as incomplete questionnaires may not be useable.

Section 1

The following questions measure the routineness of the work in your unit. Before your respond to these items stop and think about your unit for a moment. What is the basic task that is performed by your unit? For example, a travel agency would have the basic task of assisting customers in making travel plans. As you respond to the questions below, respond with respect to the basic task of your unit. If you believe your unit has several basic tasks, try to give an average or representative response. Mark your answer in the blank for each question. Use the following scales in responding to each item below.

        1 - To a very great extent
        2 - To a great extent
        3 - To some extent
        4 - To a little extent
        5 - To a very little extent

____ Normal work activities are guided by standard procedures, directives, and rules.

____ You need to know a lot of procedures and standard practices to do the work well.

____ There is an understandable sequence of steps that can be followed in carrying out the work.

____ The employees actually rely on established procedures and practices.

____ Established materials (manuals, standards, directives, technical and professional books) cover the work.

____ There is variety in the events which cause the work.

____ The work can be described as routine.

____ Most work decisions are dissimilar from one day to the next.

____ It takes a lot of experience and training to know what to do when a problem arises.

____ Problems require an extensive and demanding search for a solution.

Section 2

The questions in this section are about your unit's relationships with various sectors of the environment in which it operates (for example, suppliers and customers). Specifically, please rate the characteristics or behavior of various sectors of your unit's environment on the degree of their predictability using the scale provided and the last two years as your time frame. Circle an 'NA' if the particular factor is not relevant for your unit.

	Highly Predictable				Highly Unpredictable	
1. Suppliers of your raw materials and components:						
• their price changes are	1	2	3	4	5	NA
• quality changes	1	2	3	4	5	NA
• introduction of new materials or components	1	2	3	4	5	NA
2. Competitors' actions:						
• their price changes are	1	2	3	4	5	NA
• product quality changes	1	2	3	4	5	NA
• introduction of new products	1	2	3	4	5	NA
3. Customers:						
• their demand for existing products is	1	2	3	4	5	NA
• demand for new products	1	2	3	4	5	NA
4. Government and regulatory agencies:						
• changes in laws or agency policies on pricing are	1	2	3	4	5	NA
• changes in laws or policies on product standards or quality	1	2	3	4	5	NA
• changes in labor (personnel) laws or policies methods	1	2	3	4	5	NA
5. Action of labor unions:						
• changes in wages, hours, and working conditions are	1	2	3	4	5	NA
• changes in grievance procedures	1	2	3	4	5	NA
6. The larger organization your unit is a part of:	1	2	3	4	5	NA
• changes in corporate goals are						
• changes in how a business unit's performance is evaluated	1	2	3	4	5	NA
• changes in corporate structure	1	2	3	4	5	NA
7. Other business units in your organization:	1	2	3	4	5	NA
• changes in transfer prices are						
• changes in the quality or quantity of inputs these units supply to you	1	2	3	4	5	NA
• changes in the quality or quantity of outputs you supply to other units	1	2	3	4	5	NA

Section 3

The questions in this section are about the level of decentralization of decision-making authority in your unit. Please indicate the *lowest* level at which the following decisions can be made in your business unit.

In marking your responses use the following scale.

> 0 - This decision cannot be made by anyone in my unit, including me.
> 1 - This decision can be made only by me.
> 2 - This decision can be made by the higher level managers in my unit.
> 3 - This decision can be made by the lower level managers in my unit.
> 4 - This decision can be made by the supervisors in my unit.
> 5 - This decision can be made by the lowest level employee in my unit.
> NA - This decision is inappropriate for my unit.

If this scale does not reflect the the structure of your unit, for example, if your unit only has one layer of management, then add or delete layers to reflect your unit's structure. Please note any changes above on the scale provided.

_____ Create a new job.

_____ Hire a new employee.

_____ Create a new department.

_____ Set a price for a product or service.

_____ Choose a supplier.

_____ Determine purchasing procedures.

_____ Determine training methods for employees.

_____ Develop new products or markets.

_____ Develop a marketing strategy.

_____ Authorize the purchase of a new piece of machinery or equipment

Section 4

The following questions are about the usefulness of your *annual operating budget*. Annual operating budget refers to a budget consisting of a projected income statement with whatever supporting schedules you have, such as sales or revenue budgets, production budgets, labor budgets, budgeted cost of goods sold, and budgeted selling, general, and administrative expenses, for the coming one-year period. Please answer the questions about how useful *your budget* is, not about how useful *budgets in general* are.

Check the appropriate box for each item.

	Almost Never	Seldom	Some-times	Often	Almost Always
1. Budgets are useful to *manage* this unit because:					
• differences between actual and budgeted amounts highlight problems which need to be investigated.	☐	☐	☐	☐	☐
• they highlight when the unit is deviating from plans.	☐	☐	☐	☐	☐
2. Budgets are useful in this unit's *planning* because:					
• the process of preparing the budget causes those involved to deal with differences between their own goals and the goals of the company.	☐	☐	☐	☐	☐
• the differences between the resources required to achieve our plans and our present resources are identified as the budgets are prepared.	☐	☐	☐	☐	☐
• the process of preparing them gives those involved a chance to stop and think about the future.	☐	☐	☐	☐	☐
3. Budgets are useful to *motivate* the personnel in this unit because:					
• they let people know what is expected of them.	☐	☐	☐	☐	☐
• they let people know what is important to the company.	☐	☐	☐	☐	☐
• they provide goals and targets to be obtained during the year.	☐	☐	☐	☐	☐
• they direct people toward company goals rather than personal goals.	☐	☐	☐	☐	☐
• their pay can be linked to achieving budget goals.	☐	☐	☐	☐	☐
4. Budgets are useful to *evaluate* the personnel in this unit because:					
• they provide a better benchmark than last year's performance.	☐	☐	☐	☐	☐
• they can be used as standards against which actual performance is evaluated.	☐	☐	☐	☐	☐
5. Budgets are useful in *coordinating* the parts of this unit because:					
• all of the different parts must work together to prepare the budget.	☐	☐	☐	☐	☐
• during the year as they are prepared, those involved must examine how the units parts are related.	☐	☐	☐	☐	☐
• when decisions are made which are beneficial to one part of the unit, but not to another part of the unit or to the unit as a whole, this will show up in budget variances.	☐	☐	☐	☐	☐

Section 5

The questions in this section are about your unit's performance. As you answer the questions try to be objective. Remember that the questions are about your *unit's* performance, not *your* performance. Circle the correct number for each question.

Please indicate the degree of importance which is attached by your superiors to each of the following items when evaluating your unit's performance. If a particular item is not appropriate for your unit, mark the item 'NA'.

		Of Little Importance		Important		Extremely Important	
1.	Sales growth rate	1	2	3	4	5	NA
2.	Market share	1	2	3	4	5	NA
3.	Operating profits	1	2	3	4	5	NA
4.	Profit margins	1	2	3	4	5	NA
5.	Cash flow	1	2	3	4	5	NA
6.	Return on investment	1	2	3	4	5	NA
7.	New product development	1	2	3	4	5	NA
8.	Market development	1	2	3	4	5	NA
9.	Research and development	1	2	3	4	5	NA
10.	Cost reduction programs	1	2	3	4	5	NA
11.	Personnel training development	1	2	3	4	5	NA
12.	Political and public affairs	1	2	3	4	5	NA

Now please indicate your unit's actual performance as compared with the expectations of the level which should be reached. You do not need to rate any items marked NA above.

		Not at all Satisfactory		Satisfactory		Outstanding
1.	Sales growth rate	1	2	3	4	5
2.	Market share	1	2	3	4	5
3.	Operating profits	1	2	3	4	5
4.	Profit margins	1	2	3	4	5
5.	Cash flow	1	2	3	4	5
6.	Return on investment	1	2	3	4	5
7.	New product development	1	2	3	4	5
8.	Market development	1	2	3	4	5
9.	Research and development	1	2	3	4	5
10.	Cost reduction programs	1	2	3	4	5
11.	Personnel training development	1	2	3	4	5
12.	Political and public affairs	1	2	3	4	5

Section 6

The last section of questions contain questions about a variety of subjects. Answer each question in the space provided.

1. Describe the product your unit produces and/or the industry your unit is in.

2. Approximate number of employees in your unit. _____

3. How long has your unit existed? _____ (Years)

4. How long have you been in your present position?
   _____ (Years) _____ (months)

5. Which of the following is used to measure your unit's financial performance (Check one):
   _____ Costs only
   _____ Revenues only
   _____ Profits
   _____ Return on investment
   _____ Other (Please specify) _____
   _____ None of the above

6. Which of the following best describes your professional background:
   _____ Production/Operations
   _____ Marketing/Sales
   _____ Finance/Accounting
   _____ Engineering/Research & Development
   _____ Other (Please specify) _____

7. Which of the following best describes the highest level of education you have completed:
   _____ High School
   _____ 2-year Associates Degree
   _____ 4-year College Degree
   _____ Graduate Degree

8. How old are you? _____ (Years)

9. Sex. M_____ F_____

10. How many employees of your unit participate in some manner in preparing your annual budget? _____

11. How many employees in your unit have full-time jobs related to preparing and analyzing your budgets? _____

12. How many employees in your unit are evaluated by comparing their performance against a budget standard? _____

13. How many employees pay in your unit is based in part on their performance as compared to the budget? _____

14. How many months before the beginning of a particular year would the members of your unit begin work developing the budget for the upcoming year? _____ (Months)

15. How frequently are actual results compared to to budgeted amounts?
    _____ Weekly
    _____ Monthly
    _____ Quarterly
    _____ Semiannually
    _____ Annually
    _____ This is not done on a regular basis

16. In an average month how much time do *you* spend looking over the budget and comparing it to actual results? _____ (hours)

17. If you held one hundred meetings a year with your unit's managers, in how many of those meetings would you discuss budget related subjects, based on the present meetings with your managers? _____ (meetings)

Thank you for your time. Your participation is greatly appreciated. Please mail the survey back in the postage-paid envelope provided.

VIRGINIA TECH
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

June 6, 1988

Dear Business Unit Manager:

Competition and change are two words which describe the current business environment. The level of competition in both domestic and foreign markets coupled with the high rate of social and technological change have stretched many businesses to their limits. A number of questions have been raised by managers as they attempt to respond to these ever-increasing pressures. For example, What can be learned from the Japanese? What will be the effect of new information processing and manufacturing technologies?

In searching for the answers to these and other important questions, it has become clear that the present level of understanding about many basic organizational processes is quite limited. This study is directed toward increasing our knowledge of a fundamental part of a company's accounting system - its operating budget. Specifically the study will focus on the usefulness of operating budgets to business unit managers.

Your company has agreed to sponsor this study by providing its endorsement and by mailing this survey to a group of it business unit managers - that is how you were selected for the study. It is important that you complete the enclosed questionnaire to aid in this study. You should find that the whole questionnaire can be completed in less than thirty minutes.

While only a few of the questions are potentially sensitive, you may be assured that all of your answers will remain confidential. The questionnaire has an identification number only for control purposes.

I would be most happy to answer any questions that you might have. Please write or call. The telephone number is (703) 961-6591.

Thank you for your assistance.

Sincerely,

Jack M. Cathey
Department of Accounting
The R. B. Pamplin College of Business
Virginia Tech
Blacksburg, VA 24061

Questionnaire

200

Appendix B

Data Coding, Transformation, and Selection

A description of the process used to code, transform, and select the data used in this dissertation is contained in this appendix. A rational will be provided, as needed, for the decisions which were made in this process. This appendix should prove to be useful in both the evaluation and interpretation of the results obtained.

B.1 Data Coding

As each survey was received back from the respondent, the researcher coded the front of the survey booklet with the following information: a unique survey number to be used in associating the coded data with its original source; the date

received, to be used in a test for non-response bias, the state from which the survey was mailed, as supplementary data; and the original survey number assigned by the researcher prior to survey distribution.

These data items along with each response was then coded into a computer file. The instrument was designed to provide primarily numerical responses. Virtually all of the coding involved simply typing the response into the file. A response of 'NA' was coded as a "9" and a missing response was coded as a '8'. The only significant interpretation necessary was in coding the answer to the question.

> "Describe the product your unit produces and/or the industry your
> unit is in."

In this case the researcher assigned each firm to one of three categories - service, manufacturing, and other. Since this variable is not used in any of the research questions this non-objective approach was considered acceptable.

B.2   Data Transformation

Each section of the survey collected data for one or more variables. The data transformation will be explained one section at a time.

Section one of the questionnaire contained ten questions related to task uncertainty. The first transformation was to set any answer coded 8 ('NA') or 9 (missing answer) to zero. Also the number of missing answers for a particular

survey were counted. Lastly, questions 6, 8, 9, 10 were reverse scored. These items were transformed by subtracting the answer from six. For example, if a respondent answered question eight with a one, the adjusted response was set to five (6 - 1). Next the adjusted answers were summed to develop an overall score for task uncertainty. The measure increases as task uncertainty increases.

Section two contained seven different sections, each section related to a specific aspect of the environment, and contained a total of nineteen questions. Just as in section one, all "NA" and missing response answers were first set to zero. Next, the total number of missing responses was summed. Lastly, each question's answer was summed to compute an overall environmental uncertainty score. This score increases with increasing environmental uncertainty. The overall score of surveys which contained missing responses to questions for these observations was adjusted by assuming that the missing answer was equal to the average answer of the other questions. This method was chosen over simply setting the answer to zero since an "NA" response was made available on the questionnaire form.

Section three contained ten questions used to measure decentralization. After setting missing answers and "NA" answers to zero a decentralization score was created by summing all ten responses. This measure would increase with increasing levels of decentralization. Responses which contained missing answers of not applicable were adjusted by adding the average answer for the applicable answered questions.

Section four included five sections containing a total of fifteen questions about budget usefulness. An overall score for budget usefulness was computed by summing the answers to each question, with missing observations set to zero. (There was no "NA" response in this section).

Section five was divided into two parts. In part one the respondent was asked to indicate the degree of importance attached by their superior to a list of twelve items such as market share and return on investment. If the item was not appropriate for the unit the respondent could indicate so by circling an "NA". In the second part of the section the respondent indicated their units actual performance on the same twelve items.

The first step in computing the performance score was to set all missing answers and NA answers to zero. Next, missing answers and NA's were counted for each questionnaire. The third step involved multiplying the answer from part one (degree of importance) by the answer to part two (actual performance) for each of the twelve items. Each product was then added to compute an overall performance score. Lastly the total performance score was adjusted for missing observations and NA responses by adding the average of the responses given. In other words, each answer was scaled to produce a total score for only those questions which were answered and were appropriate for their unit.

The final section, section six, contained a total of seventeen questions. These questions covered several different variables and should be discussed individually.

Question one required the respondent to describe their product and/or industry and was used to place the business unit into the categories of service, manufacturing, or other. Question two was used to determine the size of the unit and requested the number of employees. Question three and four pertained to the number of years the unit has existed and the length of time the business unit manager has been in their present position.

Question five was used to screen each unit as to whether it was a profit center or not. The question asked the respondent to indicate whether their unit's financial performance was measured using only costs, only revenues, profits, return on investment, or other. Only those units which used profit or return on investment were used in the analysis.

Questions six through nine collected demographic data about the respondent. Questions ten through seventeen collected data for the budget use index.

The budget used index was computed as follows. First each question's answer was indexed to range from zero to one. For example, question ten asked how many employees participate directly in the preparation of the annual budget. By dividing the answer to question ten by the total number of employees in the unit a participation index was created. After each of the answers to these eight questions had been indexed, an overall budget use index was computed by summing each question's index.

B.3   Data Selection

Every response received before August 1, 1988 was coded and every response coded by transformed as described above. The final step before the actual analysis was to select the data to be used. Table 11 on page 207reconciles the total number of responses received with the actual number of surveys used in the results section.

A total of 78 surveys received were not used for the following reasons. Seven surveys were received after the coding deadline, fifty-two responses received were not from profit centers, fifteen responses were eliminated for failure to meet the minimum size of 40 employees. Lastly four responses were eliminated due to a large number of missing answers. The final number of useable observations which were included in the analysis was 103.

Table 11.	Reconciliation of Surveys Received and Surveys Used		
	Number Received		181
	Reason for exclusion:		
	Received after coding deadline	7	
	Not a profit center	52	
	Less than 40 employees	15	
	Missing answers	5	
	Subtotal		78
	Number used		103

Appendix C

GEMINI Listings

The primary data analysis method used was path analysis. The GEMINI package developed by Wolfle and Ethington (1985) was utilized to perform this analysis. Four GEMINI listings are contained in this appendix. The first listing is for the basic model. These results are reported in Figure 14 on page 153 and were used to test Hypotheses 1, 2, and 3. Hypothesis 4a was based upon the analysis of the full model and is included as Figure 15 on page 157. The second GEMINI listing in this appendix contains the reults for the full model. Hypothsis 4b required that the data be split based on unit performance. The third and fourth listings in this appendix support Figure 16 on page 160 and Figure 17 on page 161, respectively.

C.1 Basic Model

```
THE FOLLOWING CONTROL CARDS HAVE BEEN READ:

BUDGET USEFULNESS STUDY - BASIC MODEL
  5  2    103
PTU       PEU       LNSIZE    DECEN     BUS
FU

  5  4  4  3  2  1
  4  3  3  2  1
  5  4  3  2  1
WARNING:  THIS PROGRAM CALCULATES STANDARD ERRORS AND
THEIR PROBABILITIES ON THE ASSUMPTION OF LARGE SAMPLE SIZES.
WITH SMALL SAMPLES, AS IN THIS CASE, THE PROBABILITIES OF
BOTH DIRECT AND INDIRECT EFFECTS MUST BE INTERPRETED WITH
CAUTION AS THEY ARE PROBABLY UNDERESTIMATED.
BUDGET USEFULNESS STUDY - BASIC MODEL
THE FOLLOWING DATA HAVE BEEN READ:
                MEAN            STD DEV

PTU           30.4175           5.1971
PEU           42.7188           9.6111
LNSIZE         5.7876           1.2964
DECEN         18.0434           5.7277
BUS           56.8620           9.5630
N OF CASES =    103
CORRELATIONS:

              PTU       PEU       LNSIZE    DECEN     BUS

PTU         1.0000    0.0738    0.1156    0.0402    0.0861
PEU         0.0738    1.0000    0.2283   -0.0380    0.1503
LNSIZE      0.1156    0.2283    1.0000    0.2177    0.3745
DECEN       0.0402   -0.0380    0.2177    1.0000    0.0529
BUS         0.0861    0.1503    0.3745    0.0529    1.0000

REGRESSION EQUATION # 1    DEPENDENT VARIABLE: BUS
THE INDEPENDENT VARIABLES ARE: DECEN
                               LNSIZE
                               PEU
                               PTU
MULTIPLE R          .38317        ANALYSIS OF VARIANCE
R SQUARE            .14682                           DF     SUM OF SQUARES     MEAN SQUARE
STANDARD ERROR     9.01164        REGRESSION          4        1369.51831       342.37939
                                  RESIDUAL           98        7958.55469        81.20973
                                  F =     4.21599    SIGNIF F = 0.00376
----------------------------------- REGRESSION EQUATION -----------------------------
VARIABLE        B               SE B            BETA            T           SIG T

DECEN       -0.0414258        0.1603293       -0.0248118      -0.2583796    0.79611
LNSIZE       2.6594820        0.7301906        0.3605206       3.6421747    0.00027
PEU          0.0637485        0.0958896        0.0640691       0.6648114    0.50617
PTU          0.0748258        0.1730907        0.0406650       0.4322926    0.66553
INTERCEPT   37.2181396

REGRESSION EQUATION # 2    DEPENDENT VARIABLE: DECEN
THE INDEPENDENT VARIABLES ARE: LNSIZE
                               PEU
                               PTU
MULTIPLE R          .23644        ANALYSIS OF VARIANCE
R SQUARE            .05591                           DF     SUM OF SQUARES     MEAN SQUARE
STANDARD ERROR     5.64903        REGRESSION          3         187.07574        62.35858
                                  RESIDUAL           99        3159.23877        31.91150
                                  F =     1.95411    SIGNIF F = 0.12443
----------------------------------- REGRESSION EQUATION -----------------------------
VARIABLE        B               SE B            BETA            T           SIG T

LNSIZE       1.0462856        0.4454835        0.2368078       2.3486509    0.01884
PEU         -0.0557183        0.0598478       -0.0934951      -0.9310003    0.35185
PTU          0.0217257        0.1084814        0.0197131       0.2002713    0.84127
INTERCEPT   13.7072897
```

```
THE MATRIX OF DIRECT EFFECTS (METRIC):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            0.0000    0.0000    0.0000    0.0000    0.0000
DECEN         -0.0414    0.0000    0.0000    0.0000    0.0000
LNSIZE         2.6595    1.0463    0.0000    0.0000    0.0000
PEU            0.0637   -0.0557    0.0000    0.0000    0.0000
PTU            0.0748    0.0217    0.0000    0.0000    0.0000

THE MATRIX OF INDIRECT EFFECTS (METRIC):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            0.0000    0.0000    0.0000    0.0000    0.0000
DECEN          0.0000    0.0000    0.0000    0.0000    0.0000
LNSIZE        -0.0433    0.0000    0.0000    0.0000    0.0000
PEU            0.0023    0.0000    0.0000    0.0000    0.0000
PTU           -0.0009    0.0000    0.0000    0.0000    0.0000

THE MATRIX OF STANDARD ERRORS FOR INDIRECT EFFECTS (METRIC):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            0.0000    0.0000    0.0000    0.0000    0.0000
DECEN          0.0000    0.0000    0.0000    0.0000    0.0000
LNSIZE         0.1688    0.0000    0.0000    0.0000    0.0000
PEU            0.0093    0.0000    0.0000    0.0000    0.0000
PTU            0.0057    0.0000    0.0000    0.0000    0.0000

THE MATRIX OF T-VALUES FOR INDIRECT EFFECTS (METRIC):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            0.0000    0.0000    0.0000    0.0000    0.0000
DECEN          0.0000    0.0000    0.0000    0.0000    0.0000
LNSIZE        -0.2568    0.0000    0.0000    0.0000    0.0000
PEU            0.2490    0.0000    0.0000    0.0000    0.0000
PTU           -0.1583    0.0000    0.0000    0.0000    0.0000

THE MATRIX OF TWO-TAILED PROBABILITIES OF T-VALUES FOR INDIRECT EFFECTS (METRIC):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            1.0000    1.0000    1.0000    1.0000    1.0000
DECEN          1.0000    1.0000    1.0000    1.0000    1.0000
LNSIZE         0.7973    1.0000    1.0000    1.0000    1.0000
PEU            0.8034    1.0000    1.0000    1.0000    1.0000
PTU            0.8742    1.0000    1.0000    1.0000    1.0000

THE MATRIX OF TOTAL CAUSAL EFFECTS (METRIC):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            0.0000    0.0000    0.0000    0.0000    0.0000
DECEN         -0.0414    0.0000    0.0000    0.0000    0.0000
LNSIZE         2.6161    1.0463    0.0000    0.0000    0.0000
PEU            0.0661   -0.0557    0.0000    0.0000    0.0000
PTU            0.0739    0.0217    0.0000    0.0000    0.0000

THE MATRIX OF DIRECT EFFECTS (STANDARDIZED):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            0.0000    0.0000    0.0000    0.0000    0.0000
DECEN         -0.0248    0.0000    0.0000    0.0000    0.0000
LNSIZE         0.3605    0.2368    0.0000    0.0000    0.0000
PEU            0.0641   -0.0935    0.0000    0.0000    0.0000
PTU            0.0407    0.0197    0.0000    0.0000    0.0000

THE MATRIX OF INDIRECT EFFECTS (STANDARDIZED):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            0.0000    0.0000    0.0000    0.0000    0.0000
DECEN          0.0000    0.0000    0.0000    0.0000    0.0000
LNSIZE        -0.0059    0.0000    0.0000    0.0000    0.0000
PEU            0.0023    0.0000    0.0000    0.0000    0.0000
PTU           -0.0005    0.0000    0.0000    0.0000    0.0000

THE MATRIX OF TOTAL CAUSAL EFFECTS (STANDARDIZED):
          TO:   BUS       DECEN     LNSIZE    PEU       PTU
FROM:
BUS            0.0000    0.0000    0.0000    0.0000    0.0000
DECEN         -0.0248    0.0000    0.0000    0.0000    0.0000
LNSIZE         0.3546    0.2368    0.0000    0.0000    0.0000
PEU            0.0664   -0.0935    0.0000    0.0000    0.0000
PTU            0.0402    0.0197    0.0000    0.0000    0.0000
```

C.2 Full Model

```
THE FOLLOWING CONTROL CARDS HAVE BEEN READ:
BUDGET USEFULNESS STUDY - FULL MODEL INCLUDING PERFORMANCE
   6   3    103
PTU      PEU       LNSIZE    DECEN    BUS      PERF
FU

   6  5  5  4  3  2  1
   5  4  4  3  2  1
   4  3  3  2  1
   6  5  4  3  2  1
WARNING:  THIS PROGRAM CALCULATES STANDARD ERRORS AND
THEIR PROBABILITIES ON THE ASSUMPTION OF LARGE SAMPLE SIZES.
WITH SMALL SAMPLES, AS IN THIS CASE, THE PROBABILITIES OF
BOTH DIRECT AND INDIRECT EFFECTS MUST BE INTERPRETED WITH
CAUTION AS THEY ARE PROBABLY UNDERESTIMATED.
BUDGET USEFULNESS STUDY - FULL MODEL INCLUDING PERFORMANCE
THE FOLLOWING DATA HAVE BEEN READ:
              MEAN         STD DEV
PTU        30.4175        5.1971
PEU        42.7188        9.6111
LNSIZE      5.7876        1.2964
DECEN      18.0434        5.7277
BUS        56.8620        9.5630
PERF      155.5234       37.9569
N OF CASES =    103
CORRELATIONS:
           PTU       PEU      LNSIZE    DECEN     BUS      PERF

PTU      1.0000    0.0738    0.1156    0.0402    0.0861    0.1262
PEU      0.0738    1.0000    0.2283   -0.0380    0.1503    0.0634
LNSIZE   0.1156    0.2283    1.0000    0.2177    0.3745    0.2640
DECEN    0.0402   -0.0380    0.2177    1.0000    0.0529   -0.0720
BUS      0.0861    0.1503    0.3745    0.0529    1.0000    0.2678
PERF     0.1262    0.0634    0.2640   -0.0720    0.2678    1.0000
```

```
REGRESSION EQUATION # 1    DEPENDENT VARIABLE: PERF
THE INDEPENDENT VARIABLES ARE:  BUS
                                DECEN
                                LNSIZE
                                PEU
                                PTU
MULTIPLE R         .35753         ANALYSIS OF VARIANCE
R SQUARE           .12783                              DF    SUM OF SQUARES   MEAN SQUARE
STANDARD ERROR   36.35014         REGRESSION            5     18784.93750     3756.98750
                                  RESIDUAL             97    128169.31200     1321.33301
                                  F =    2.84333      SIGNIF F = 0.01919
------------------------------ REGRESSION EQUATION ------------------------------
VARIABLE         B               SE B            BETA            T          SIG T

BUS          0.7519996        0.4074638       0.1894622      1.8455610     0.06496
DECEN       -0.8890780        0.6469382      -0.1341628     -1.3742857     0.16935
LNSIZE       6.3749495        3.1383796       0.2177283      2.0312862     0.04223
PEU         -0.1051984        0.3876596      -0.0266375     -0.2713679     0.78611
PTU          0.6727049        0.6988589       0.0921081      0.9625762     0.33576
INTERCEPT   75.9414520
```

```
REGRESSION EQUATION # 2    DEPENDENT VARIABLE: BUS
THE INDEPENDENT VARIABLES ARE:  DECEN
                                LNSIZE
                                PEU
                                PTU
MULTIPLE R         .38317         ANALYSIS OF VARIANCE
R SQUARE           .14682                              DF    SUM OF SQUARES   MEAN SQUARE
STANDARD ERROR    9.01164         REGRESSION            4      1369.51831      342.37939
                                  RESIDUAL             98      7958.55469       81.20975
                                  F =    4.21599      SIGNIF F = 0.00376
------------------------------ REGRESSION EQUATION ------------------------------
VARIABLE         B               SE B            BETA            T          SIG T

DECEN       -0.0414258        0.1603293      -0.0248118     -0.2583796     0.79611
LNSIZE       2.6594820        0.7301906       0.3605206      3.6421747     0.00027
PEU          0.0637485        0.0958896       0.0640691      0.6648114     0.50617
PTU          0.0748258        0.1730907       0.0406650      0.4322926     0.66553
INTERCEPT   37.2181396
```

```
REGRESSION EQUATION # 3    DEPENDENT VARIABLE: DECEN
THE INDEPENDENT VARIABLES ARE:  LNSIZE
                                PEU
                                PTU
MULTIPLE R         .23644         ANALYSIS OF VARIANCE
R SQUARE           .05591                              DF    SUM OF SQUARES   MEAN SQUARE
STANDARD ERROR    5.64903         REGRESSION            3       187.07574       62.35858
                                  RESIDUAL             99      3159.23877       31.91150
                                  F =    1.95411      SIGNIF F = 0.12443
------------------------------ REGRESSION EQUATION ------------------------------
VARIABLE         B               SE B            BETA            T          SIG T

LNSIZE       1.0462856        0.4454835       0.2368078      2.3486509     0.01884
PEU         -0.0557183        0.0598478      -0.0934951     -0.9310003     0.35185
PTU          0.0217257        0.1084814       0.0197131      0.2002713     0.84127
INTERCEPT   13.7072897
```

```
THE MATRIX OF DIRECT EFFECTS (METRIC):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
BUS         0.7520    0.0000    0.0000    0.0000    0.0000    0.0000
DECEN      -0.8891   -0.0414    0.0000    0.0000    0.0000    0.0000
LNSIZE      6.3749    2.6595    1.0463    0.0000    0.0000    0.0000
PEU        -0.1052    0.0637   -0.0557    0.0000    0.0000    0.0000
PTU         0.6727    0.0748    0.0217    0.0000    0.0000    0.0000

THE MATRIX OF INDIRECT EFFECTS (METRIC):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
BUS         0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
DECEN      -0.0512    0.0000    0.0000    0.0000    0.0000    0.0000
LNSIZE      1.0371   -0.0433    0.0000    0.0000    0.0000    0.0000
PEU         0.0992    0.0023    0.0000    0.0000    0.0000    0.0000
PTU         0.0363   -0.0009    0.0000    0.0000    0.0000    0.0000

THE MATRIX OF STANDARD ERRORS FOR INDIRECT EFFECTS (METRIC):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
BUS         0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
DECEN       0.1217    0.0000    0.0000    0.0000    0.0000    0.0000
LNSIZE      1.4442    0.1688    0.0000    0.0000    0.0000    0.0000
PEU         0.1008    0.0093    0.0000    0.0000    0.0000    0.0000
PTU         0.1674    0.0057    0.0000    0.0000    0.0000    0.0000

THE MATRIX OF T-VALUES FOR INDIRECT EFFECTS (METRIC):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
BUS         0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
DECEN      -0.2559    0.0000    0.0000    0.0000    0.0000    0.0000
LNSIZE      0.7181   -0.2568    0.0000    0.0000    0.0000    0.0000
PEU         0.9842    0.2490    0.0000    0.0000    0.0000    0.0000
PTU         0.2167   -0.1583    0.0000    0.0000    0.0000    0.0000

THE MATRIX OF TWO-TAILED PROBABILITIES OF T-VALUES FOR INDIRECT EFFECTS (METRIC):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
BUS         1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
DECEN       0.7980    1.0000    1.0000    1.0000    1.0000    1.0000
LNSIZE      0.4727    0.7973    1.0000    1.0000    1.0000    1.0000
PEU         0.3250    0.8034    1.0000    1.0000    1.0000    1.0000
PTU         0.8285    0.8742    1.0000    1.0000    1.0000    1.0000

THE MATRIX OF TOTAL CAUSAL EFFECTS (METRIC):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
BUS         0.7520    0.0000    0.0000    0.0000    0.0000    0.0000
DECEN      -0.9202   -0.0414    0.0000    0.0000    0.0000    0.0000
LNSIZE      7.4121    2.6161    1.0463    0.0000    0.0000    0.0000
PEU        -0.0060    0.0661   -0.0557    0.0000    0.0000    0.0000
PTU         0.7090    0.0739    0.0217    0.0000    0.0000    0.0000

THE MATRIX OF DIRECT EFFECTS (STANDARDIZED):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
BUS         0.1895    0.0000    0.0000    0.0000    0.0000    0.0000
DECEN      -0.1342   -0.0248    0.0000    0.0000    0.0000    0.0000
LNSIZE      0.2177    0.3605    0.2368    0.0000    0.0000    0.0000
PEU        -0.0266    0.0641   -0.0935    0.0000    0.0000    0.0000
PTU         0.0921    0.0407    0.0197    0.0000    0.0000    0.0000

THE MATRIX OF INDIRECT EFFECTS (STANDARDIZED):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
BUS         0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
DECEN      -0.0047    0.0000    0.0000    0.0000    0.0000    0.0000
LNSIZE      0.0354   -0.0059    0.0000    0.0000    0.0000    0.0000
PEU         0.0251    0.0023    0.0000    0.0000    0.0000    0.0000
PTU         0.0050   -0.0005    0.0000    0.0000    0.0000    0.0000

THE MATRIX OF TOTAL CAUSAL EFFECTS (STANDARDIZED):
      TO:   PERF      BUS       DECEN     LNSIZE    PEU       PTU
FROM:
PERF        0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
BUS         0.1895    0.0000    0.0000    0.0000    0.0000    0.0000
DECEN      -0.1389   -0.0248    0.0000    0.0000    0.0000    0.0000
LNSIZE      0.2531    0.3546    0.2368    0.0000    0.0000    0.0000
PEU        -0.0015    0.0664   -0.0935    0.0000    0.0000    0.0000
PTU         0.0971    0.0402    0.0197    0.0000    0.0000    0.0000
```

C.3 Low Performance Group

```
THE FOLLOWING CONTROL CARDS HAVE BEEN READ:

BUDGET USEFULNESS STUDY - LOW PERFORMANCE GROUP
  5   2     53
PTU        PEU        LNSIZE    DECEN     BUS
FU


  5   4   4   3   2   1
  4   3   3   2   1
  5   4   3   2   1
WARNING:  THIS PROGRAM CALCULATES STANDARD ERRORS AND
THEIR PROBABILITIES ON THE ASSUMPTION OF LARGE SAMPLE SIZES.
WITH SMALL SAMPLES, AS IN THIS CASE, THE PROBABILITIES OF
BOTH DIRECT AND INDIRECT EFFECTS MUST BE INTERPRETED WITH
CAUTION AS THEY ARE PROBABLY UNDERESTIMATED.
BUDGET USEFULNESS STUDY - LOW PERFORMANCE GROUP
THE FOLLOWING DATA HAVE BEEN READ:
                MEAN          STD DEV

PTU          30.1887         5.7781
PEU          43.2277         9.2232
LNSIZE        5.4734         1.0930
DECEN        18.8674         5.1066
BUS          55.0526        10.4311
N OF CASES =     53
CORRELATIONS:

                PTU       PEU      LNSIZE    DECEN      BUS

PTU          1.0000    0.0375    0.2215    0.0954    0.0673
PEU          0.0375    1.0000    0.3236   -0.0800    0.3255
LNSIZE       0.2215    0.3236    1.0000    0.2143    0.3971
DECEN        0.0954   -0.0800    0.2143    1.0000    0.0436
BUS          0.0673    0.3255    0.3971    0.0436    1.0000

REGRESSION EQUATION # 1   DEPENDENT VARIABLE: BUS
THE INDEPENDENT VARIABLES ARE: DECEN
                               LNSIZE
                               PEU
                               PTU
MULTIPLE R          .44866          ANALYSIS OF VARIANCE
R SQUARE            .20130                                DF     SUM OF SQUARES   MEAN SQUARE
STANDARD ERROR     9.70297          REGRESSION            4         1138.95581     284.73877
                                    RESIDUAL             48         4519.08203      94.14754
                                    F =     3.02439    SIGNIF F = 0.02610
--------------------------------------- REGRESSION EQUATION -----------------------------------
VARIABLE           B                 SE B              BETA            T            SIG T

DECEN          -0.0177065         0.2736342        -0.0086682      -0.0647087      0.94841
LNSIZE          3.1620674         1.3742949         0.3313417       2.3008652      0.02140
PEU             0.2466803         0.1563088         0.2181143       1.5781603      0.11453
PTU            -0.0242448         0.2392092        -0.0134299      -0.1013538      0.91927
INTERCEPT      28.1478729

REGRESSION EQUATION # 2   DEPENDENT VARIABLE: DECEN
THE INDEPENDENT VARIABLES ARE: LNSIZE
                               PEU
                               PTU
MULTIPLE R          .26967          ANALYSIS OF VARIANCE
R SQUARE            .07272                                DF     SUM OF SQUARES   MEAN SQUARE
STANDARD ERROR     5.06566          REGRESSION            3           98.61124      32.87041
                                    RESIDUAL             49         1257.38452      25.66090
                                    F =     1.28095    SIGNIF F = 0.29072
--------------------------------------- REGRESSION EQUATION -----------------------------------
VARIABLE           B                 SE B              BETA            T            SIG T

LNSIZE          1.2048044         0.6965327         0.2578847       1.7297163      0.08368
PEU            -0.0914372         0.0805524        -0.1651492      -1.1351271      0.25632
PTU             0.0393176         0.1247584         0.0444883       0.3151497      0.75265
INTERCEPT      15.0386848
```

```
THE MATRIX OF DIRECT EFFECTS (METRIC):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          0.0000   0.0000   0.0000   0.0000   0.0000
DECEN       -0.0177   0.0000   0.0000   0.0000   0.0000
LNSIZE       3.1621   1.2048   0.0000   0.0000   0.0000
PEU          0.2467  -0.0914   0.0000   0.0000   0.0000
PTU         -0.0242   0.0393   0.0000   0.0000   0.0000

THE MATRIX OF INDIRECT EFFECTS (METRIC):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          0.0000   0.0000   0.0000   0.0000   0.0000
DECEN        0.0000   0.0000   0.0000   0.0000   0.0000
LNSIZE      -0.0213   0.0000   0.0000   0.0000   0.0000
PEU          0.0016   0.0000   0.0000   0.0000   0.0000
PTU         -0.0007   0.0000   0.0000   0.0000   0.0000

THE MATRIX OF STANDARD ERRORS FOR INDIRECT EFFECTS (METRIC):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          0.0000   0.0000   0.0000   0.0000   0.0000
DECEN        0.0000   0.0000   0.0000   0.0000   0.0000
LNSIZE       0.3299   0.0000   0.0000   0.0000   0.0000
PEU          0.0251   0.0000   0.0000   0.0000   0.0000
PTU          0.0110   0.0000   0.0000   0.0000   0.0000

THE MATRIX OF T-VALUES FOR INDIRECT EFFECTS (METRIC):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          0.0000   0.0000   0.0000   0.0000   0.0000
DECEN        0.0000   0.0000   0.0000   0.0000   0.0000
LNSIZE      -0.0647   0.0000   0.0000   0.0000   0.0000
PEU          0.0646   0.0000   0.0000   0.0000   0.0000
PTU         -0.0634   0.0000   0.0000   0.0000   0.0000

THE MATRIX OF TWO-TAILED PROBABILITIES OF T-VALUES FOR INDIRECT EFFECTS (METRIC):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          1.0000   1.0000   1.0000   1.0000   1.0000
DECEN        1.0000   1.0000   1.0000   1.0000   1.0000
LNSIZE       0.9484   1.0000   1.0000   1.0000   1.0000
PEU          0.9485   1.0000   1.0000   1.0000   1.0000
PTU          0.9495   1.0000   1.0000   1.0000   1.0000

THE MATRIX OF TOTAL CAUSAL EFFECTS (METRIC):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          0.0000   0.0000   0.0000   0.0000   0.0000
DECEN       -0.0177   0.0000   0.0000   0.0000   0.0000
LNSIZE       3.1407   1.2048   0.0000   0.0000   0.0000
PEU          0.2483  -0.0914   0.0000   0.0000   0.0000
PTU         -0.0249   0.0393   0.0000   0.0000   0.0000

THE MATRIX OF DIRECT EFFECTS (STANDARDIZED):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          0.0000   0.0000   0.0000   0.0000   0.0000
DECEN       -0.0087   0.0000   0.0000   0.0000   0.0000
LNSIZE       0.3313   0.2579   0.0000   0.0000   0.0000
PEU          0.2181  -0.1651   0.0000   0.0000   0.0000
PTU         -0.0134   0.0445   0.0000   0.0000   0.0000

THE MATRIX OF INDIRECT EFFECTS (STANDARDIZED):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          0.0000   0.0000   0.0000   0.0000   0.0000
DECEN        0.0000   0.0000   0.0000   0.0000   0.0000
LNSIZE      -0.0022   0.0000   0.0000   0.0000   0.0000
PEU          0.0014   0.0000   0.0000   0.0000   0.0000
PTU         -0.0004   0.0000   0.0000   0.0000   0.0000

THE MATRIX OF TOTAL CAUSAL EFFECTS (STANDARDIZED):
        TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS          0.0000   0.0000   0.0000   0.0000   0.0000
DECEN       -0.0087   0.0000   0.0000   0.0000   0.0000
LNSIZE       0.3291   0.2579   0.0000   0.0000   0.0000
PEU          0.2195  -0.1651   0.0000   0.0000   0.0000
PTU         -0.0138   0.0445   0.0000   0.0000   0.0000
```

C.4 High Performance Group

```
THE FOLLOWING CONTROL CARDS HAVE BEEN READ:

BUDGET USEFULNESS STUDY - HIGH PERFORMANCE GROUP
  5  2    50
PTU       PEU       LNSIZE    DECEN     BUS
FU

  5  4  4  3  2  1
  4  3  3  2  1
  5  4  3  2  1
WARNING:  THIS PROGRAM CALCULATES STANDARD ERRORS AND
THEIR PROBABILITIES ON THE ASSUMPTION OF LARGE SAMPLE SIZES.
WITH SMALL SAMPLES, AS IN THIS CASE, THE PROBABILITIES OF
BOTH DIRECT AND INDIRECT EFFECTS MUST BE INTERPRETED WITH
CAUTION AS THEY ARE PROBABLY UNDERESTIMATED.
BUDGET USEFULNESS STUDY - HIGH PERFORMANCE GROUP
THE FOLLOWING DATA HAVE BEEN READ:
              MEAN           STD DEV

PTU         30.6600          4.5475
PEU         42.1794         10.0716
LNSIZE       6.1207          1.4179
DECEN       17.1700          6.2535
BUS         58.7800          8.2221
N OF CASES =    50
CORRELATIONS:

              PTU      PEU     LNSIZE    DECEN     BUS

PTU         1.0000   0.1269  -0.0035  -0.0027   0.0984
PEU         0.1269   1.0000   0.1972  -0.0204  -0.0293
LNSIZE     -0.0035   0.1972   1.0000   0.3015   0.3081
DECEN      -0.0027  -0.0204   0.3015   1.0000   0.1340
BUS         0.0984  -0.0293   0.3081   0.1340   1.0000

REGRESSION EQUATION # 1   DEPENDENT VARIABLE: BUS
THE INDEPENDENT VARIABLES ARE: DECEN
                               LNSIZE
                               PEU
                               PTU
MULTIPLE R          .34228       ANALYSIS OF VARIANCE
R SQUARE            .11715                         DF     SUM OF SQUARES    MEAN SQUARE
STANDARD ERROR     8.06157       REGRESSION         4        388.07886       97.01971
                                 RESIDUAL          45       2924.50439       64.98898
                                 F =     1.49286   SIGNIF F = 0.21940
------------------------------ REGRESSION EQUATION ------------------------------
VARIABLE        B                SE B            BETA            T          SIG T

DECEN        0.0474928        0.1938657       0.0361214      0.2449781     0.80647
LNSIZE       1.8464832        0.8725344       0.3184261      2.1167145     0.03428
PEU         -0.0862645        0.1180752      -0.1056679     -0.7305896     0.46503
PTU          0.2043604        0.2554476       0.1130226      0.8000089     0.42371
INTERCEPT   44.0356293

REGRESSION EQUATION # 2   DEPENDENT VARIABLE: DECEN
THE INDEPENDENT VARIABLES ARE: LNSIZE
                               PEU
                               PTU
MULTIPLE R          .31241       ANALYSIS OF VARIANCE
R SQUARE            .09760                         DF     SUM OF SQUARES    MEAN SQUARE
STANDARD ERROR     6.13112       REGRESSION         3        187.02267       62.34088
                                 RESIDUAL          46       1729.17159       37.59067
                                 F =     1.65841   SIGNIF F = 0.18785
------------------------------ REGRESSION EQUATION ------------------------------
VARIABLE        B                SE B            BETA            T          SIG T

LNSIZE       1.4030437        0.6303661       0.3181252      2.2257595     0.02603
PEU         -0.0523424        0.0894682      -0.0843002     -0.5850390     0.55852
PTU          0.0125589        0.1942684       0.0091324      0.0646470     0.94846
INTERCEPT   10.4051008
```

```
THE MATRIX OF DIRECT EFFECTS (METRIC):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           0.0000   0.0000   0.0000   0.0000   0.0000
DECEN         0.0475   0.0000   0.0000   0.0000   0.0000
LNSIZE        1.8465   1.4030   0.0000   0.0000   0.0000
PEU          -0.0863  -0.0523   0.0000   0.0000   0.0000
PTU           0.2044   0.0126   0.0000   0.0000   0.0000

THE MATRIX OF INDIRECT EFFECTS (METRIC):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           0.0000   0.0000   0.0000   0.0000   0.0000
DECEN         0.0000   0.0000   0.0000   0.0000   0.0000
LNSIZE        0.0666   0.0000   0.0000   0.0000   0.0000
PEU          -0.0025   0.0000   0.0000   0.0000   0.0000
PTU           0.0006   0.0000   0.0000   0.0000   0.0000

THE MATRIX OF STANDARD ERRORS FOR INDIRECT EFFECTS (METRIC):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           0.0000   0.0000   0.0000   0.0000   0.0000
DECEN         0.0000   0.0000   0.0000   0.0000   0.0000
LNSIZE        0.2736   0.0000   0.0000   0.0000   0.0000
PEU           0.0110   0.0000   0.0000   0.0000   0.0000
PTU           0.0095   0.0000   0.0000   0.0000   0.0000

THE MATRIX OF T-VALUES FOR INDIRECT EFFECTS (METRIC):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           0.0000   0.0000   0.0000   0.0000   0.0000
DECEN         0.0000   0.0000   0.0000   0.0000   0.0000
LNSIZE        0.2435   0.0000   0.0000   0.0000   0.0000
PEU          -0.2260   0.0000   0.0000   0.0000   0.0000
PTU           0.0625   0.0000   0.0000   0.0000   0.0000

THE MATRIX OF TWO-TAILED PROBABILITIES OF T-VALUES FOR INDIRECT EFFECTS (METRIC):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           1.0000   1.0000   1.0000   1.0000   1.0000
DECEN         1.0000   1.0000   1.0000   1.0000   1.0000
LNSIZE        0.8076   1.0000   1.0000   1.0000   1.0000
PEU           0.8212   1.0000   1.0000   1.0000   1.0000
PTU           0.9502   1.0000   1.0000   1.0000   1.0000

THE MATRIX OF TOTAL CAUSAL EFFECTS (METRIC):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           0.0000   0.0000   0.0000   0.0000   0.0000
DECEN         0.0475   0.0000   0.0000   0.0000   0.0000
LNSIZE        1.9131   1.4030   0.0000   0.0000   0.0000
PEU          -0.0888  -0.0523   0.0000   0.0000   0.0000
PTU           0.2050   0.0126   0.0000   0.0000   0.0000

THE MATRIX OF DIRECT EFFECTS (STANDARDIZED):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           0.0000   0.0000   0.0000   0.0000   0.0000
DECEN         0.0561   0.0000   0.0000   0.0000   0.0000
LNSIZE        0.3184   0.3181   0.0000   0.0000   0.0000
PEU          -0.1057  -0.0843   0.0000   0.0000   0.0000
PTU           0.1130   0.0091   0.0000   0.0000   0.0000

THE MATRIX OF INDIRECT EFFECTS (STANDARDIZED):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           0.0000   0.0000   0.0000   0.0000   0.0000
DECEN         0.0000   0.0000   0.0000   0.0000   0.0000
LNSIZE        0.0115   0.0000   0.0000   0.0000   0.0000
PEU          -0.0030   0.0000   0.0000   0.0000   0.0000
PTU           0.0003   0.0000   0.0000   0.0000   0.0000

THE MATRIX OF TOTAL CAUSAL EFFECTS (STANDARDIZED):
         TO:  BUS      DECEN    LNSIZE   PEU      PTU
FROM:
BUS           0.0000   0.0000   0.0000   0.0000   0.0000
DECEN         0.0561   0.0000   0.0000   0.0000   0.0000
LNSIZE        0.3299   0.3181   0.0000   0.0000   0.0000
PEU          -0.1087  -0.0843   0.0000   0.0000   0.0000
PTU           0.1134   0.0091   0.0000   0.0000   0.0000
```

The vita has been removed from
the scanned document