

**THE EFFICACY OF BUDGETS AS A  
MANAGEMENT CONTROL SYSTEM**

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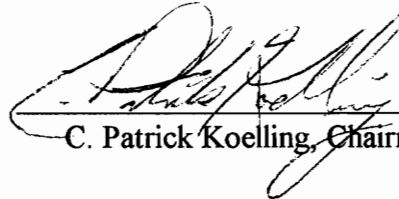
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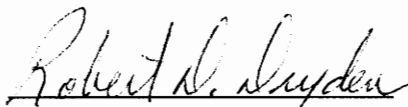
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**APPROVED:**

  
C. Patrick Koelling, Chairman

  
Robert D. Dryden

  
Paul E. Torgersen

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Blacksburg, Virginia

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## ABSTRACT

Traditionally, control systems are evaluated on the basis of the efficiency of their use and their effectiveness in accomplishing goals and objectives. The need to continuously improve efficiency has become a way of life for many organizations. During economic hardship such need is further amplified and emphasized. However, efficiency measures have little to do with the success of a given control system or the organization in general. Increasing efficiency may buy additional time, but only at the expense of risking the future; a penny wise and a pound foolish. Similarly, effectiveness measures provide management with too little information and too late to correct what is wrong or to help them avoid undesired results in the future.

The current research was motivated by the criticism against organizational researchers as being "*primarily students of performance or efficiency, and only incidentally students of organizations*" (Thompson, 1967 :6). Much of organizational research remains confined to considering the efficiency of organizational actions or the effectiveness of its outcome, and may account for the little progress in understanding organizational behaviors. This study represents a new approach to researching organizations by focusing attention on the input side of budgetary systems. The findings from this study point to the need to include efficacy measure in the evaluation of the performance of control systems such as budgets. By considering efficacy measures, management can assume a proactive role in assessing the performance of a budgetary system at a point in time when potential problems can be resolved; during inception.

The results from this study should not be construed as being against the consideration of effectiveness or efficiency measures. If anything, the current study emphasizes the need of having a systemic and holistic view of evaluating the performance of budgetary systems. Without efficiency measures, organizations risk entropy and chaos. Without effectiveness measures, there would be no feedback to fine-tune organizational actions. However, considering such measures alone will only reflect a partial and biased evaluation.

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## RESEARCH DOMAIN

### Introduction

The subject of management control systems<sup>1</sup> has received considerable attention by both researchers and practitioners. Researchers such as Robert Anthony made a life-long career out of trying to define what control is, and how it is different from the other functions of management<sup>2</sup>. Koontz (1984), Etzioni(1965), Markus (1976), Gibbs (1989), and Joerges(1988) are only a few of the multi-disciplinary researchers attempting to understand the construct of control. Practitioners (managers), on the other hand, have extensively utilized--and in many cases abused<sup>3</sup>-- such systems; management by objectives, cost accounting, budgeting, and time-event networks (PERT, CPM, & Gantt charts) are but a fraction of the possible number of control systems available to managers.

### Problem Statement

Although control-related literature is voluminous, researchers seem to have lost sight of an

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<sup>1</sup> According to Anthony, "a control system is a system whose purpose is to attain and maintain a desired state or condition." (1980: 3)

<sup>2</sup> No agreement seems to have been reached regarding the number of the functions of management. However, Henri Fayol provides what seems to be the basis for these functions: Plan, organize, command, coordinate, and control (Koontz, 1984).

<sup>3</sup> Merit rating and management by objectives are two examples where control systems have traditionally been abused.

essential characteristic of a control system; its efficacy<sup>4</sup>. This raises two important questions; the first of which is

1. Given a particular management control system, what is its efficacy?

We can safely hypothesize that management control systems exist, at least within bounds of rationality, to achieve, maintain, or avoid a certain condition. We can also assume that managers adopt such systems for a purpose. Therefore, it is important to know if a particular management control system is effective or is not (accomplishing the purpose of the manager, and/or satisfying the condition for which it was designed). Such knowledge would also aid in designing control systems with optimum efficacy in mind, or selecting control systems that are more likely to attain the purpose for which they are intended. Even if the design or selection of a control system is not feasible, the manager will know, in advance, how much effort to place on any of the available control systems given their efficacy.

"Efficacy" is an ambiguous term, especially when referring to control systems. To clear up this ambiguity requires defining efficacy and, hence, leads to the second question.

2. What determines the efficacy of a management control system? What are the characteristics, attributes, measures and magnitude, and/or features which determine if a control system will produce intended results?

The first question seems more important, but to answer it the second question becomes more immediate.

### **Sub-Problems**

Enumerating efficacy determinants for a given control system does not alone provide the needed visibility to later answer the second question. We should also differentiate among efficacy variables in terms of their importance and impact. To do so, we must address the

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<sup>4</sup> According to the New World Dictionary, efficacy is the "power to produce effects or intended results."

following sub-problems:

1. Can efficacy variables be placed into subcategories as they relate to
  - a) the use of the control system,
  - b) inherent characteristics of the control system
  - c) the users<sup>5</sup>, or
  - d) the purpose of the control system under study?
2. What is the relative importance of each of the variables? The impact of some variables may be greater than others. Knowing which variables are most important allows setting priorities in evaluating them.
3. What are the possible relationships between the variables? It is very likely that the interaction between some variables can produce a greater effect than they would individually. It is also possible that some variables may counteract each others' effect.

## **Limitations**

The outlined problem --and the corresponding questions-- require a great deal of resources and an even greater amount of time to study in full. Therefore, the scope of this research must be limited to allow for empirical testing . Furthermore, each of the questions seems to lend itself to different types of research. To investigate the first major question requires applied research, while the second major question better lends itself to basic research.

In this research one type of management control systems are examined, and the variables that determine the efficacy of such systems are found. Hence, only the second question

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<sup>5</sup> Refers to the characteristics of the users as well as external factors that might affect how the control system is being utilized. The external factors relate to the level of the organization, its structure, and possibly the environment within which the organization operates.

will be addressed. The first question can not be investigated before addressing the second question.

## **Research Question**

Given time and resource limitations, it was necessary to narrow the focus of this research to consider only **budgeting** as the control system in question; specifically, addressing only the following question.

**What determines the efficacy of budgeting (revenue and expense budgets) as a control system? In other words, what are the variables that empower a budgetary control system to produce intended results?**

The research should not result in a mere listing of variables. It should also provide information about the relative importance of each of the variables and, if possible, the interactions between them.

## **Assumptions**

1. Under norms of rationality<sup>6</sup>, and given alternative means of control, the greater the efficacy, the greater the relative frequency with which a manager will employ that means of control.

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<sup>6</sup> What may appear non rational to an observer may be rational to the actor, given his perspective and set of premises. "A decision is generally defined as rational or non rational according to some set of rules defining what actions are reasonable or consistent with a given set of premises. In this connection, it is possible to identify four basic categories of non rational decision.

1. Illogical decision. When an innovator confuses a possible and necessary consequence of his actions.

2. Blind decision. When certain consequences important to the decision are not considered.

2. Efficacy is important for maximization of the benefit/cost ratio. Managers develop or use control systems to realize, maintain, or avoid a condition. Utilizing resources without reaching the desired end is costly.
3. When a manager engages in attempted control, it is successful to the extent that he or she perceives the condition in question as having been realized, maintained, or avoided.
4. Control systems are intentional (deliberate), purposeful, and perceived as attainable<sup>7</sup>.
5. Managers operating control systems are competent enough to know how to use such systems, and to decide what actions should be taken when problems arise.

## **Research Objectives**

The research will attain the following objectives.

1. Identify the variables that can affect the efficacy of revenue and expense budgets.
2. Assess the importance of each of the variables and their impact on the efficacy of budgets.
3. Select a subset of these variables (approximately twenty percent of the total) that account for the majority (at least eighty percent) of the impact on the efficacy of budgets.
4. Model the efficacy of budgets as a function of these most important variables.

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3. Rash decision. When a decision is made after an incomplete or hasty review of the discernible alternatives.

4. Ignorant action. Where there are mistakes about the facts or available relevant facts are omitted from consideration" (Steiss, 1972, pp. 24-25).

<sup>7</sup> Control systems are designed deliberately to achieve or avoid a condition (the purpose of a control system). This condition (purpose), must be attainable by the users of the control system.

## **Research Purpose**

The purpose of the proposed research is to provide needed ground work for future research in management control systems. The findings will allow future researchers to effectively and consistently answer the question of whether a given budget is capable of producing intended results. Furthermore, a similar approach can be used to 1) identify common efficacy variables among all management control systems, 2) determine which control systems are most effective, and ultimately 3) predict the efficacy of a control system before it is implemented.

## **Research Importance**

The field of Management Systems Engineering (MSE), as I see it, is concerned with the design, development, and implementation of management systems. These systems, control systems included, require assessment to determine whether or not they are producing intended results. The assessment of the efficacy of control systems is not only relevant to implementation, but also to design and development. According to Koontz, control systems are not ends in themselves, they are first planning systems and then control systems. "The task of control is to make plans succeed, and naturally, in doing so, controls must reflect plans, and planning must precede control" (Koontz, 1984: 572). Therefore, being able to identify and model efficacy variables for control systems will give needed insight into all dimensions (design, development, and implementation) of management systems.

The ability to effectively assess the efficacy of control systems is a difficult and a subjective task. The assessor will have to rely on judgment and experience. Since no two persons' subjective perceptions of such a complex problem --an ill-defined problem in the first place-- is the same, the chances of them reaching the same conclusion, or for that matter using the same decision parameters, is minimal. Identification of the appropriate variables is, therefore, essential to accurately and consistently assess control systems.

### *Efficacy: Post-facto vs A-priori*

Most managers would like to know how effective a given control system is before they begin using it. Such knowledge could be used to design or modify the control system accordingly for maximum efficacy. While this is important, the ability to measure and monitor the efficacy of a control system is equally so. In fact, the reason many control systems often fail to accomplish their objectives is due to the lack of follow-up and monitoring, not because they were poorly designed<sup>8</sup>. The "control of a control system"<sup>9</sup> is, therefore, important to determine if a given management control system is doing what it is intended to do, and to allow for changes or modifications to be made if it is not. Figure 1 depicts the process of controlling a control system.

### *The Importance of Budgets*

The choice of the area of budgeting for investigation was motivated by the following observations:

1. Budgets have been considered by many as the primary device for control. It is also one of the control systems most used by managers. Therefore, investigating and understanding the efficacy of budgets will provide a larger impact on overall management systems than any other control system.
2. Since budgets are used by most managers, this research can be done in a short time frame and still have validity and generalizability.

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<sup>8</sup> This conclusion is based mainly on the researcher's experience, and the general sentiment of the available literature on control. Merchant and Simons (1986) and Maciariello (1984) hint to this problem, but do not directly address it.

<sup>9</sup> Mendes (1990) researched the manager as a system's controller by looking at control systems as a hierarchical system, and focused on the "plant" part of the system.



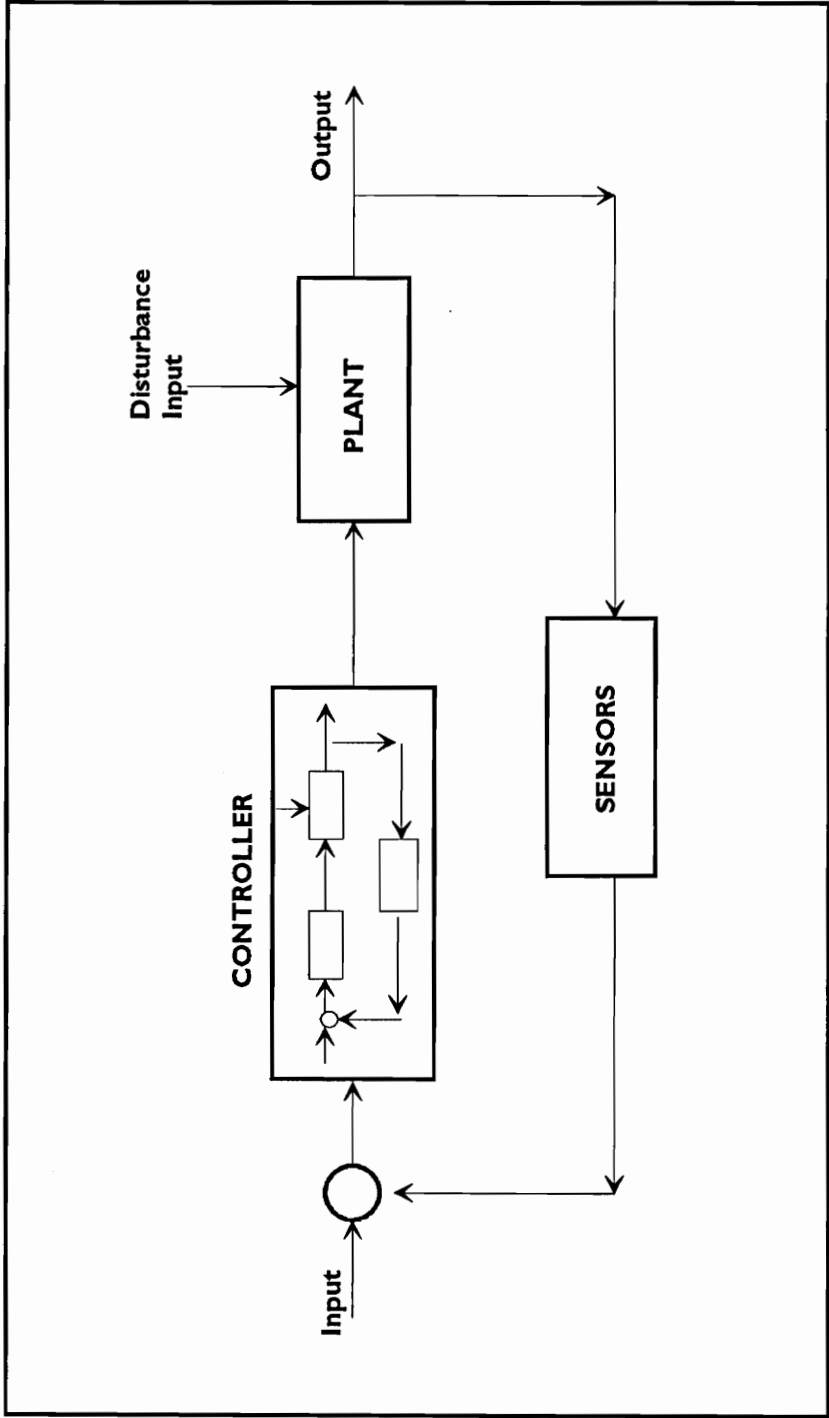


Figure 1. The Control of a Control System

## **Research Limitations**

This research will consider only academic departments within Virginia Polytechnic Institute and State University (VPI & SU). Therefore the findings of this research will be relevant<sup>10</sup> to:

1. Academic non-profit institutions,
2. Land-grant universities,
3. Academic departments,
4. Relatively small budgets, and
5. Expense and revenue budgets.

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<sup>10</sup> Since the research population does not include land-grant universities other than VPI, the ability to generalize findings will be limited to only departmental budgets within VPI. One may argue that the results are relevant to departments in other land-grant universities since VPI is such a university, but cannot make a statistical claim of such..

# **LITERATURE REVIEW**

## **Introduction**

In order to be able to review management control systems, it seems necessary to briefly pass through the jungle of definitions, theories, and concepts relating to control and control systems. This exercise should help establish a common vocabulary that can be employed in further analysis.

The following paragraphs will, first, attempt to clear up some of the confusion in the meaning of control by exploring the prevailing paradigms in control literature; namely cybernetics and servo theory. Second, an appropriate level of analysis for control will be established to aid in the definition of management control systems, and what is hoped to be accomplished through them. Finally, a review of budget history, practices, and related issues will be done to identify some efficacy variables for use in the second phase of the proposed methodology.

## **What Control Means**

The business world is plagued with many terms which take on several connotations. The term "control" is probably the most ill-defined of these terms. What does it mean to control? Who or what is to be controlled and by what or by whom, and why is it to be controlled?

The confusion in control-related literature can be attributed to three main reasons: a) an apparent confusion over the meaning of control, b) a lack of precision in the identification of an appropriate level of analysis for control, and c) the use of military metaphors for business.

### ***a) The Semantics Jungle***

One of the barriers to communication is the lack of a standard, readily-understood terminology. This problem is particularly true in the field of management, especially when one considers that management is the synthesis of so many disciplines (Acar, 1987). The terminology problem is further compounded by the proliferation of schools of thought<sup>1</sup>, the multitude of approaches to management, and the inability or unwillingness of management theorists to understand each other. Koontz says it best: "the variety of approaches to management theory has led to a kind of confused and destructive jungle warfare. Particularly among academic disciplines and their disciples, the primary interests of many would-be cult leaders seem to be to carve out a distinct (and hence "original") approach to management" (1961: 175). The end result is a semantics nightmare.

The term "control" is not any different from other management terminology. The confusion around its meaning can be attributed, at least in part, to borrowing concepts and terminology from other disciplines that preceded it, particularly, engineering, psychology, and sociology. The literature on control express this term in a variety of meanings, ranging from 'prohibit' to 'influence.' Within this variety, two major themes emerge. First, to control is to dominate and enforce one's will on others. Second, control is viewed as regulation; detecting the difference between 'what is' and 'what should be,' provides the stimulus for action (Emmanuel, Otley, and Merchant, 1990).

### ***b) Level of Analysis***

The body of literature relating to control of complex organizations amplifies the confusion in its meaning by significantly varying the scope and the level of analysis (Merchant and Simons, 1986). The lack of precision in the identification of an appropriate level of

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<sup>1</sup> Koontz (1961) classifies the major schools of management theory into six main groups:

1. The management process school,
2. The Empirical school,
3. The human behavior school,
4. The social system school,
5. The decision Theory school, and
6. The mathematical school

analysis leads to the inability to distinguish between control as it relates to individuals<sup>2</sup>, society (groups of people controlling each other's behavior), organizations (controlling its internal activities in response to the environment in which it operates), and governments (society controlling the activities of organizations or individuals within it). While these classifications of control are related, attempts to generalize the finding in any one of them without the aid of an appropriate framework<sup>3</sup> can only lead to further confusion.

### *c) Military Metaphors and Business*

Many of today's business words were borrowed from military metaphors, and many have been taken out of context. Organizations have strategic and tactical plans, they have staff and chains of command, and when they want to accomplish anything, they develop tactics, and a plan of attack. According to Weick, "the use of military metaphors severely limits our ability to think about management sensibly. Military metaphors are a bad choice when it comes to the problem of managing a commercial enterprise because people solve problems by analogy, and as long as they use the military analogy, it forces people to entertain a very limited set of solutions to solve any problem and a very limited set of ways to organize themselves" (1979: 49)<sup>4</sup>.

"Control" is one of the metaphors adapted from the military to the business environment. As a result, the term "control" tends to lead to the notion of "controller"; the impression of someone with the power to change and influence the ideas and actions of individuals. The notion of control as evil, therefore, causes people to resist any attempt of controlling them, and might explain the cause behind the failure of some control systems. To

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<sup>2</sup> Personal control is "an individual's belief, at a given point in time, in his or her ability to affect a change, in a desired direction, on the environment" (Greenberger and Strasser, 1986: 165).

<sup>3</sup> According to Anthony, "Materials dealing with any broad subject needs to be organized within a framework of topics and subtopics.... to make it possible for one to reach conclusions generally applicable to each classification but not to other classifications". Frameworks are also useful by indicating the limits within which researchers findings are pertinent (1965: 1-3).

<sup>4</sup> This quote was obtained from Peters and Waterman, In Search of Excellence, (New York, Warner Books, 1982, p. 101)

**Table 1. Views and definitions of control**

<p><b>Control</b></p> <ol style="list-style-type: none"><li>1. "The selection in part, but especially the promotion, demotion, and dismissal of men, depends upon the exercise of supervision or what is often called control" (Barnard, 1938: 223).</li><li>2. "The presence in a business of that force which guides it to a predetermined objective by means of predetermined policies and decisions" (Lemkem, 1961: 8).</li><li>3. "The process by which a person, group, or organization consciously determine or influence what another person, group, or organization will do" (Hellriegel &amp; Slocum, 1982: 435).</li><li>4. Assuring implementation of strategies (Anthony, 1988).</li><li>5. "Overt behavior by a human in the belief that (1) the behavior increases or decreases the probability of some subsequent condition, (2) the increase or decrease is desirable" (Gibbs, 1989: 52).</li><li>6. "The measurement and correction of the performance of activities of subordinates in order to make sure that all levels of objectives and plans devised to attain them are being accomplished (Koontz, et al, 1984: 549).</li></ol> <p><b>Control Process</b></p> <ol style="list-style-type: none"><li>1. "One of integrating of the whole, of finding the effective balance between the local and the broad considerations, between the general and the specific requirements" (Barnard, 1938: 238).</li><li>2. "the way in which persons deal with others always consists of an attempt to control them....." (Burns, 1958: 137).</li></ol> <p><b>Control System</b></p> <ol style="list-style-type: none"><li>1. "A mechanism designed to limit the decision space of individuals within an organization so as to affect their behavior. Its purpose is to coordinate the decisions which they make so as to increase the probability of achieving the organization's goal" (Brinberg, &amp; Snodgrass, 1988: 447).</li><li>2. Control systems provide feedback and sanctions act to focus attention on achieving certain ends (O'Rielly, 1983).</li></ol> <p><b>Management Control</b></p> <p>"The process by which management assures that resources are obtained and used effectively in the accomplishment of organization's objectives" (Anthony, 1965: 17).</p>
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illustrate the confusion in the literature regarding control, Table 1 presents some of the definitions and views of control.

## **The Concept of Control**

Having identified the reasons for the confusion surrounding the meaning of control, the next step should be to define what is meant by control. To do so, however, requires examining of the origin of this term, and understanding its general meaning<sup>5</sup>.

Control literature reflects two major paradigms; cybernetics and servo theory. Cybernetics comes from the Greek word meaning 'steersman,' and has to do with self-regulation. In its broad view, cybernetics may encompass much of natural science. Its main premise is that all goal-seeking behaviors function in the same way whether mechanical, biological, or social. Servo theory -- also known as control theory -- deals with the design of man-made systems that are also self-regulating. Central to both cybernetics and servo theory is the concept of feedback of corrective information regarding deviation from a preset goal (Blanchard & Fabrycky, 1990). While cybernetics and servo theory have many similarities in how they view the process of control, elaborating on both should provide a better understanding of the general meaning of control.

### *Cybernetics' View of Control Systems*

The word cybernetics was first used in 1947 by Norbert Wiener in his classic book "Cybernetics"<sup>6</sup> (Blanchard & Fabrycky, 1990). Under this paradigm, control has essentially the same basic process found in biological, physical, or social systems. Wiener

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<sup>5</sup> A meaning that is applicable to any kind of controlled system whether biological, physical, or organizational.

<sup>6</sup> N. Wiener, *Cybernetics*, (New York: John Wiley & Sons, Inc., 1948).

Wiener did not explicitly define cybernetics until his later book titled "Cybernetics: control and communication in the animal and the machine" (New York: John Wiley & Sons, Inc., 1948).

emphasized communication, or information flow, as the primary mechanism for attaining and maintaining control. An essential feature of a cybernetic system is the concept of information feedback, by which all types of systems control themselves by pointing out any deviation from goals and initiating corrective actions.

### **The Cybernetic Control Process**<sup>7</sup>

Cybernetic systems are dynamic systems. The control process within this paradigm is repetitive and contains eight elements as shown in Figure 2. These elements include:

1. Set goals and performance measures
2. Measure achievement
3. Compare achievement with goals
4. Compute the deviation from goals
5. Report the variance
6. Determine cause(s) of the deviations
7. Take actions to eliminate deviations
8. Follow-up to ensure that goals are met

The process begins with the assumption that decisions are explained as the result of the interaction between the decision maker and its environment. This interaction is done through sensors that scan the environment for information or feedback. Sensors are mechanisms designed for data collection, and are analogous to heat sensing nerves in a biological system. The sensors collect data on changes that occur in the external environment as well as changes on the internal performance of the system.

The data sensors provided allow the decision maker element of the control system to construct certain premises concerning the systems performance and the state of the external environment. These premises (factual) are formed based on the decision maker's

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<sup>7</sup> Much of this process was adopted from Maciariello, J., Management Control Systems, (Prentice-Hall, Inc., Englewood Cliffs, N. J., 1984).



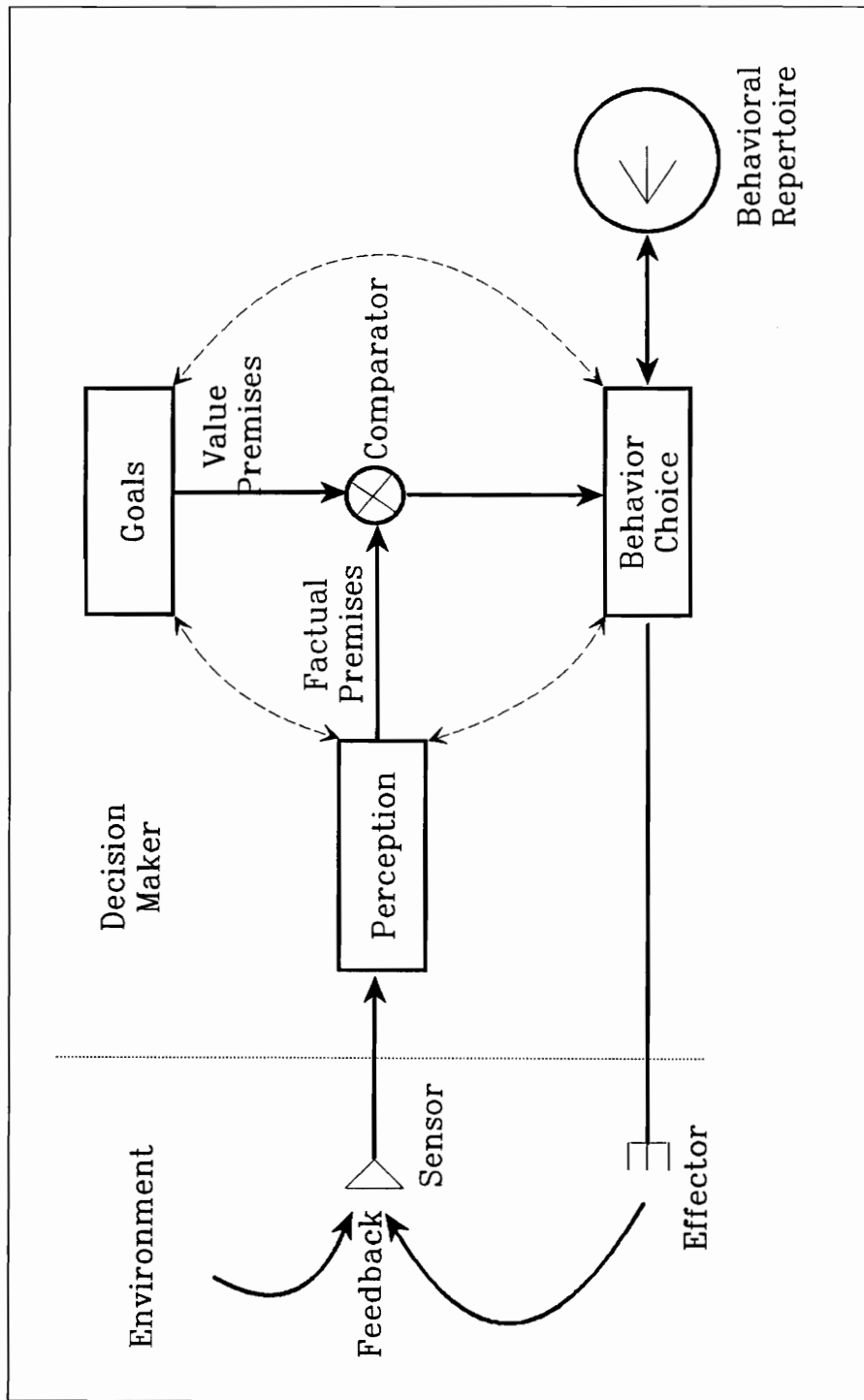


Figure 2. Cybernetic View of the Control Process (Maciariello, 1984: 10)

"perception"<sup>8</sup> of the available data. These premises are then used in a comparison process with pre-set goals. Goals represent the desired state the decision maker wishes to attain. When a difference is determined to exist between the goals (value premises) and the beliefs about the systems performance and its environment (factual premises), the decision maker is motivated to seek to close the gap. The appropriate course of action (behavioral choice) that will move the decision maker closer to its goal is determined by evoking, from experience (behavior repertoire), a limited set of alternatives that have been successful in the past.

Once an appropriate course of action has been determined, implementation of such action is done through the effector part of the cybernetic system. Control is brought about through information feedback to the sensor regarding effect of the action taken by the decision maker. Control is achieved if the action leads to a reduction or elimination of the gap, otherwise, a new course of action is initiated.

### *Engineering Perspective of Control Systems: Control Theory<sup>9</sup>*

Control theory, sometimes called automation, cybernetics, servo theory or systems theory, is a branch of applied mathematics that deals with the design of machinery and other engineering systems -- specifically man-made systems-- so that these systems are able to adapt to changes. Because environments change, except for very static systems, control systems are designed to operate and adjust to these changes occurring over time. Otherwise, these changes can lead to system instability unless control action is applied. Figure 3 shows the components of a general control system.

An example of a control system is the problem of controlling the temperature in a lecture hall. The system consists of the heating source (the plant in the control system), the lecture hall (the temperature of the lecture hall is the output of the system), and the room

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<sup>8</sup> Perception is wrongly attributed to only cognitive processes within thinking entities. Mechanical and other non living entities also have perception based on how the incoming data is interpreted.

<sup>9</sup> Much of this material was adopted from Markus, L., "Basic Concepts of Control Theory," Control Theory and Topics in Functional Analysis, International Atomic Energy Agency: Vienna, 1976.

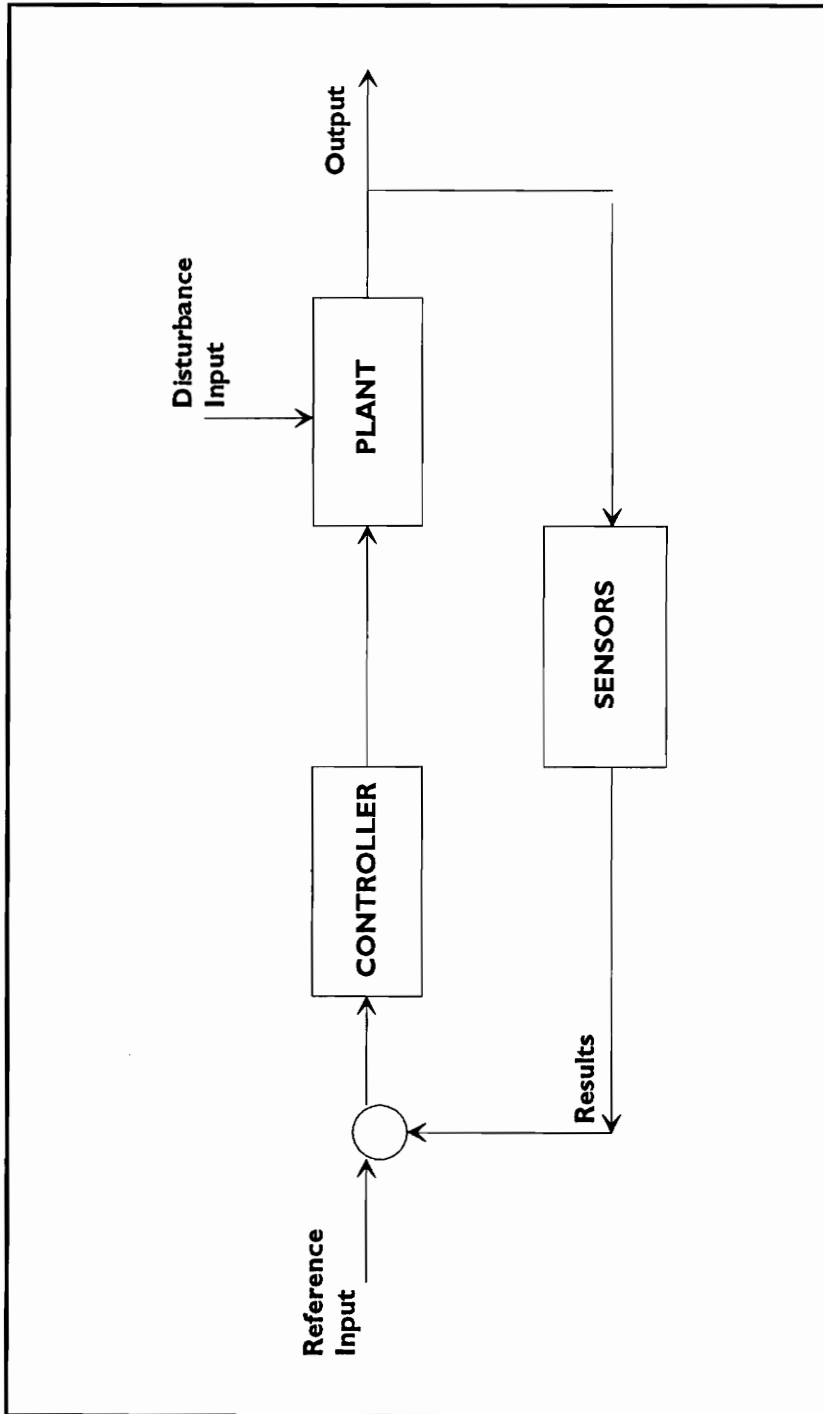


Figure 3. Elements of a Control System

thermostat as the control device for the temperature of the room. In this example, the external environment is assumed constant and not part of the control system. The thermostat is actually a combination of a thermometer (the sensor) to measure the current room temperature, a dial to set desired temperature, and an activating unit to turn on and off the electrical current. The control aspect of the thermostat is that it compares the actual and the desired temperature at each moment and then it sends the necessary signal or command to the heating source to turn the heat intensity up or down.

### **Control Theory and Dynamical Systems**

Control theory deals with the inverse problem of dynamical systems (Markus, 1976). A dynamical system, such as a system containing many vibrating masses interconnected by elastic springs, can be described mathematically by an array of ordinary differential equations that predict the evolution of the vibrations according to Newton's law of motion. The direct problem of dynamics is the analysis of the physical system (to obtain the array of mathematical differential equations) and then the analysis of the differential equations to compute the solutions describing the vibrations. On the other hand, control theory concerns the question of synthesis as the inverse of analysis; we specify the goal and seek to modify the physical and mathematical systems to incorporate this goal. In control theory, we might pick one of the known equilibrium states and insist that this must be stable so that, whatever the current state of the vibrating system, it must tend toward the desired equilibrium.

The mathematical problem of control theory, therefore, concerns the modification of differential equations, within prescribed limitations, so the solutions behave in some desired specified manner. In other words, we prescribe the desired behavior of the solutions and then seek to modify the coefficients of the dynamical equations so as to induce this behavior. We do not necessarily know the rules, but we know exactly how we want the game to end. We can, therefore, say that control theory is concerned with doing whereas dynamical systems are concerned with understanding.

Intuitively, it seems the best procedure would involve comprehension first, and then action. However, this is not always possible. Often, we must act to guide some process

when we do not understand it thoroughly. For example, the reactions that occur in the core of a nuclear reactor are not fully understood by those who have the responsibility to control them. Yet, these reactions are controlled by varying the amount of Uranium/Plutonium available for reaction through continued feedback from the core. The control of the core involves successive trials and feedback gradually converging to an effective control of the core's reactions.

### ***The Elements of Control Systems***

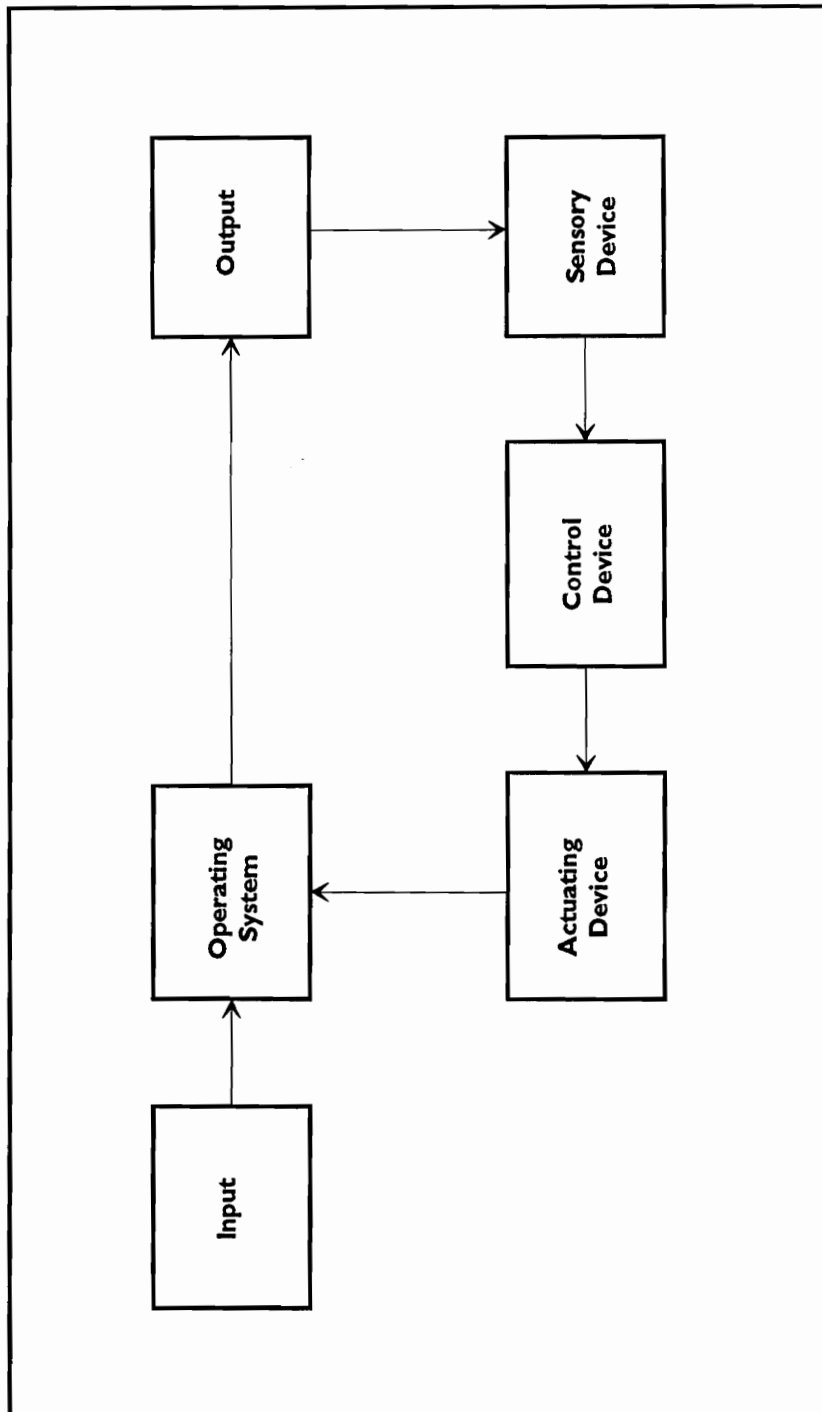
Every control system has four basic elements (Blanchard & Fabrycky, 1990). These elements always occur in the same sequence and have the same relationship to each other. Figure 4 depicts these elements and the relationships among them. The elements of control systems are:

1. A controlled characteristic or condition
2. A sensory device or method for measuring the characteristic or condition.
3. A control device that will compare measured performance with planned performance.
4. An activating device that will alter the system to bring about a change in the output characteristic or condition being controlled.

### ***Types of Control Systems***

There are four types of control systems divided into two basic categories. These categories are based on the functionality of the controlling action:

1. Condition-dependent control systems. Two types of condition-dependent systems exist; feedback and feed-forward control system.



**Figure 4. Control System-Elements and Relationships  
(Blanchard & Fabrycky, 1990)**

- a. Feedback control system. Feedback is both negative and positive. Negative feedback is the process whereby a system attempts to counteract an unfavorable deviation from a desired result. Positive feedback, on the other hand, is a process whereby the system emits a signal that leads to an action that reinforces the current system behavior and results in an ever-widening deviation from a parameters process.
  - b. Feed-forward control system. Instead of actual output being compared with goals, predictions are made of what outputs are expected to be at some future time. Control is accomplished by analyzing the inputs to a process, seeing how they interact, so that adjustments can be made in them or the process before output from the system occurs. Control is attempted before any deviation from goals actually occurs.
2. State-dependent control systems. Such systems are determined by observing whether or not the control device is an integral part of the system it controls.
    - a. Open-loop. The optimal control action is completely specified at the initial time in the system cycle; all decisions are made in advance. For example, the length of the drying cycle and temperature level of a clothes dryer is set once at the beginning of the cycle.
    - b. Closed-loop. The optimal control action is determined both by the initial conditions and by the current state-variables values; control decisions are revised in the light of new information received about the system. A home thermostat provides control signals to the furnace whenever temperature falls below a predetermined level. An essential part of a closed-loop system is feedback; a process in which the output of a system is measured continuously or at predetermined intervals.

### ***Information and Control Systems***

Information is a critical element for both cybernetic and servo theory paradigms. It is information that allows the tiny thermostat to control the heating source regardless of how

large or powerful it may be. The sensor element in the control system provides information that becomes the basis for control action. While it is not easy to separate information from the control system it supports, the information system should be distinguished from the control process. Information systems provide information flows but not the actions that are required to achieve control (Maciariello, 1984).

## **Defining Control**

In its simplest form, control is a monitoring and correction process. However, the notion of control remains a conceptual swamp without defining it at an appropriate level of analysis. Therefore, this study will be concerned with control systems at organizational levels<sup>10</sup>, and will primarily focus the analysis on those systems designed to help management attain organizational goals. In this vein, the definition of control will include two key concepts: a focus on management control systems, and a concern with the effect these systems have on organizational outcomes. Thus, understanding the control process in organizations ultimately requires study of (1) the actions of organizations (through their management control system), and (2) the process by which goals are elaborated and achieved (Merchant & Simons, 1986).

Given the task at hand, it seems appropriate to dwell on what management control systems are, what is hoped to be accomplished by them, and the linkages between such systems and the attainment of organizational goals.

## ***Management Control Systems***

"The word 'system' derives from a Greek verb meaning to place or to set together (White & Tauber, 1969). Today, the word system conveys a variety of meanings and is used in many contexts, however, the prevailing meaning is "a combination of elements working in

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<sup>10</sup> Limiting the level of analysis does not necessarily deny the impact other levels have on organization (including individual and societal levels).



unison to achieve a useful purpose." From this definition, a system is certainly not a static object or a single mechanism. It is a combination of several. Brenberg and Snodgrass reflect the confusion in the literature regarding the perception of what a management control system is -which may reflect their misunderstanding of the meaning of a system. They define management control systems (MCS) to be " a mechanism designed to limit the decision space of individuals within an organization so as to affect their behavior" (1988: 447). Attempts to define what management control systems are should first, realize the purpose such systems attempt to achieve, and then identify their elements and the relationships between them.

The purpose of a management control system is to assist management in the allocation of its resources so as to facilitate the attainment of the goals and the objectives of the organization (Maciariello, 1984: 1). The main purpose of a management control system, therefore, should be to facilitate the attainment of organizational goals, and this can only be done through an effective and efficient allocation of organizational resources. Management control systems operates at three levels of the resource allocation process. First, it is concerned with the formulation of organizational plans and goals upon which resource allocation decisions are to be made. Second, it is concerned with making decisions regarding the allocation of the resources so as to ensure that goals and objectives are met. Finally, it is concerned with monitoring performance and taking corrective action to ensure that the organization remains on track in pursuit of its overall purpose (Maciariello, 1984)<sup>11</sup> . Management control systems are further divided into two subdivisions; structure and process. The structure physically defines what the control system "is," and the process describes what the system "does."

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<sup>11</sup> These levels correspond to Anthony's framework for planning and control systems. Anthony's framework classified planning and control into three main processes:

1. Strategic planning. Deciding on objectives, changes in these objectives, resources used to attain these objectives, and policies governing the acquisition, use, and disposition of these resources.
2. Management control. Assuring resources are obtained and used effectively and efficiently in the accomplishment of objectives.
3. Operational Control. Assuring that specific tasks are carried out effectively and efficiently.

## **Control Systems and Organizational Goals**

The linkages between control systems and the attainment of organizational goals, while important, is not quite clear. This problem can be attributed to two main reasons. First, it is often argued that it may be impossible to identify goals and objectives for an organization, since only people have objectives and these are often implicit and conflicting. This argument is especially true in complex organizations where organizational goals rarely incite cooperation by the members whose effort will constitute the organization<sup>12</sup>. Furthermore, since control in organizations is often done by people through people, individual motives can result in undermining the control system regardless of how well it may have been designed.

Second, organizational structure and management style often act as constraints to the effectiveness of control systems. Organizational structure and management style may act as a barrier to the achievement of organizational goals by sub-optimizing at different levels in the structure. This may explain why "Forces other than senior management can and do play a role in shaping organizational order.....Although senior executives may attempt to formulate and implement their vision of the future, actual activities is a composite reflection of the multiple visions held by conflicting stakeholders" (Dermer, 1988: 25-30).

A management control system should bring unity of purpose to the diverse efforts of a multitude of organizational subunits so as to steer the overall organization and its managers toward its objectives and goals (Maciariello, 1984). This can only be done through monitoring the control system.

## **Budget: The Traditional Control Technique**

Budgeting is the formulation of plans for a given future period in numerical terms; often referred to as the "dollarizing of plans" (Koontz, 1984). Budgeting, as with any type of

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<sup>12</sup> According to Barnard, "A purpose can serve as an element of a cooperative system only so long as the participants do not recognize that there are serious divergence of their understanding of that purpose as the object of cooperation" (1938: 87). In complex organizations, individual motives no longer mesh with organizational purpose.

control system, must be preceded by plans if it is to succeed. However, people often do not understand how or why budgets must be based on plans. The result is an inefficient, and sometimes ineffective, allocation of resources and "a control system that serves nothing but corporate politics" (Koontz, 1984).

### *The History of Budgets*

Despite the widespread use of budgets, the concept of systematic budgeting -particularly in the public sector- is a relatively recent one<sup>13</sup>. The United States government first established the Bureau of Budget through the Budget and Accounting Act of 1921 (Babunakis, 1976). Before then, lawmaking bodies were responsible for decisions concerning appropriations requested by different agencies at different times during the year.

The early forms of budgets reflected a line-item format<sup>14</sup>, and were more concerned with the spending process than planning or program development. The Depression and the advent of the New Deal made governments aware of the necessity of meeting public needs, and budgets began to stress goals and activities other than fiscal control. In 1949, a new form of budget, designated 'performance budget,' emerged out of the need to make the budgeting process more efficient (Smithies, 1965). This new form of budgets emphasized auditing rather than project and revenue planning. While performance budgets did succeed in maintaining efficiency and economy in the government, it ignored public needs.

The Johnson administration in 1965 adopted a new form of budgets known as 'program planning budgets'<sup>15</sup>. This move was prompted by the little success performance budgets

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<sup>13</sup> Some could argue that budgets have existed for a very long time. This argument could hold if one thinks of budgets as simply to save for a rainy day. However, the systematic and cyclical process of allocating resources to plans or programs is very recent.

<sup>14</sup> Characterized by expenditures listed in broad categories, such as, clerical help and number of pieces of equipment purchased.

<sup>15</sup> Ideally, program planning budgeting is a "systematic method of linking long range-planning with yearly budgeting and evaluation. It involves definition of needs; preparation of programs with

had and the success of program planning budgets within the Department of Defense (Knezevich, 1973). Program planning budget, however, was soon abandoned in 1971 due to widespread discontent. What worked well for the Defense Department was considered impractical for the entire federal government. Today, the prevailing budgeting system in the government reflects a line-item<sup>16</sup>, or object, emphasis.

The history of budgets in the private sector is not quite as clear as it is for the public sector. However, during the 1920s and prior to use in the public sector, private businesses such as Bell Laboratories and General Motors began using a basic form of program planning budgets (Babunakis, 1976). Current budgeting practices in the private and public sector will be discussed in the following paragraphs.

### *Budgets: Planning or Control technique?*

According to Hellrilegel and Slocum (1982), "budgeting refers to determining and assigning the resources required to reach objectives." From this definition, budgeting seems more like a planning mechanism than a control mechanism. However, budgets have long been assumed as the primary device for control, and it is one of the control systems most used by managers.

The distinction of whether budgets are control systems or planning systems is not easy to make. Preparing budgets is a planning endeavor, while using these budgets is clearly a control activity. The point in time when budgets cease to be a planning mechanism and become a control mechanism is not quite clear. In fact, Anthony (1961 & 1980) claims that the distinction between the management functions of planning and control is not possible and is fruitless. He states, "although planning and control are definable abstractions and are easily understood as calling for different types of mental activities,

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objectives to respond to those needs; and program implementation by the most efficient means possible" (Babunakis, 1976: 11).

<sup>16</sup> "The line-item budget is a financial plan of estimated expenditures expressed in the terms of the kinds and quantities of objects to be purchased and the estimated revenues needed to finance them during a specified period, usually one year" (Babunakis, 1976: 8).

they do not relate to separable major categories of activities actually carried on in an organization, either at different times, or by different people, or for different situations" (1961: 10).

Although Koontz agrees with Anthony regarding the confusion between planning and control, he believes the distinction between them is useful, at least in pointing up the necessity of relating controls to plans. Koontz states that "Budgets are first planning tools and then control tools....The purpose of budgeting is to reduce plans to definite numbers to force a kind of orderliness that permit managers to see clearly what capital will be spent by whom and where, and at what expense, revenue, or units of physical input or output will be involved" (Koontz, 1984: 571-577).

#### *Types of Budgets (Koontz, 1984)*

1. Revenue and expense budgets. These are the most common types of budgets, and include sales budgets and operating expense budgets. In these budgets, plans for revenues and operating expenses are spelled out in monetary terms.
2. Time, space, material, and product budgets. These budgets are expressed in terms of physical components rather than in monetary terms, and are important at a certain stage in planning and control if dealt with in physical quantities. These include: direct-labor-hours, machine-hours, units produced, etc.
3. Capital expenditure budgets. Allocates resources to major tangible projects, such as plant, machinery, equipment, inventories, etc. The time horizon is often more than one year.
4. Cash budgets. Simply a forecast of cash receipts and disbursement against which actual cash experience is measured (perhaps the most important single control of a business).
5. Balance sheet budgets. Forecasts the status of assets, liabilities, and capital account as of particular times in the future. Since the sources of change in

balance sheet items are the various other budgets, it proves the accuracy of all other budgets.

6. Budget summaries. Complete balance sheet budgets are a form of budget summaries.

### ***Dangers in Budgeting***

Although budgets are important for the well being of an enterprise, there are some possible pitfalls. Following are some of them.

1. Over budgeting. Attempting to make budgets complete and detailed can make these budgets cumbersome, meaningless, and very expensive to maintain. Furthermore, spelling out minor expenses in detail can deprive managers of needed freedom in managing his or her department.
3. Superseding enterprise goals. Often budget goals can become more important to attain than organizational goals. This is usually the result of gaming and sub optimizing at the sub-organizational level and at the expense of the overall organization. Although this action seems counter-intuitive, it happens more often than one expects, especially, when an organization is broken up into competing parts.
4. Hiding inefficiencies. If a department once spent a given amount, often referred to as fixed or base cost, this amount becomes a floor for future budgets. Since budgets are planning tools for the future, past budgets should not provide the basis for future ones. Budget making should be accomplished by constant reexamination of standards and conversion factors by which planning is translated into numerical terms, otherwise, the budget may become an umbrella under which solvency and inefficient managers can hide (Koontz, 1984).
5. Loss of flexibility. The reduction of plans to numerical terms gives a kind of illusive definiteness. Differences between budgets and reality may make a budget obsolete, and if managers must stay within stated budgets in the face of such events, the usefulness of the budgets is reduced or nullified.

## *Avoiding the Pitfalls*

To help avoid some of the pitfalls in using budgets, other forms of budgets have been created. These include: (Koontz, 1984)

- A. Variable Budgets.** Since significant variations from plans are almost certain to occur, variable standards can be applied to provide flexibility. These budgets are designed to vary usually as the measure of output varies and so are limited largely in application to expense budgets.
- B. Zero-Base Budgeting.** Every expenditure must be justified as if it was entirely new. Organizational units are constantly required to justify increased levels of allocations as well as current expenditure levels. By starting each program from base zero, costs are calculated afresh, thus avoiding the common tendencies in budgeting to look only at changes from a previous period.
- C. Alternative budgets.** By establishing alternative budgets for alternative eventualities flexibility is enhanced.
- D. Supplementary Budgets.** Supplementary budgets are prepared each month (in addition to 6-month or 1-year budgets) to give each manager authority for scheduling output or spending funds above the basic budget, if and to the extent that the shorter-term plans so justify.
- E. Program Planning and Budgeting (PPB).** Although used primarily within the federal government, it is applicable to private institutions as well. PPB offers a rational approach to the budgetary process. It permits the evaluation of (1) the efficiency and economy of proposed programs, (2) alternative programs or alternative ways of implementing the same program, and (3) giving priority to various programs to determine their overall effectiveness (Babunakis, 1976).

## **The Dichotomy of Budget Planning and Control**

Budgets are considered the primary device for organizational control. At the same time, and as already discussed, budgeting is essentially a planning process. A budget document

serves a dual role. First, It provides a common mechanism and a system of communication for describing the plans. Second, it can offer an effective vehicle for the periodic reevaluation of goals and objectives, and facilitate the comparisons between projections and actual in light of these objectives (Steiss, 1972). Despite the potentials of these roles, budgets are often criticized for compromising long-range plans in favor of economic rationality, and for blurring the linkages between long-range plans and the goals expressed in the budget.

What would cause a seemingly integral control system, such as the budget, to create a dichotomy between planning and control? The literature reveals two possible explanations. First, it is suggested that administration models tend to emphasize problem-solving rather than long-range planning (Lemke, 1961 and Steiss, 1972). Although most managers recognize the importance of long-range planning, the prevailing paradigm in organizational management portray the manager as a problem solver rather than a planner. Furthermore, decision making and analytical mechanisms have almost always encouraged pursuing efficiency at the expense of effectiveness. Managers are often rewarded on the basis of immediate gains regardless of future consequences. Economic rationality became the root of decision making even at the expense of long-range plans. Consequently, the process of planning and the practice of administration and control have been at odds.

Second, the decision making process is further complicated by the fact that goals are not mutually exclusive. A single set of variables may be common to a number of goals; the primary variables of a low-priority goal may be a secondary variables of a high-priority goal (Steiss, 1972)<sup>17</sup>. Furthermore, since only people have objectives and these are often implicit and conflicting, it may be impossible to identify goals and objectives for an organization. Suboptimization, therefore, becomes the immediate concern, and since long range planning seems infeasible, management revert to what they have done before; problem solving.

In conclusion, many of the problems associated with budgeting are rooted in the people who have the responsibility of managing them. If budgets are to succeed in tying long-

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<sup>17</sup> This is especially true for complex organizations as they are often divided into several parts competing for the same resources



range plans to immediate goals and objectives, a unity of purpose must be brought about for all concerned. Such unity can only be attained and sustained through leadership. Not the kind of leadership that dictates, but that which motivates and enthuses others with their vision, persists on their vision despite opposition, show confidence in themselves and their mission, and inspires others to transcend their own self-interests for the overall good (Kotter, 1990).

## **RESEARCH APPROACH AND RESULTS**

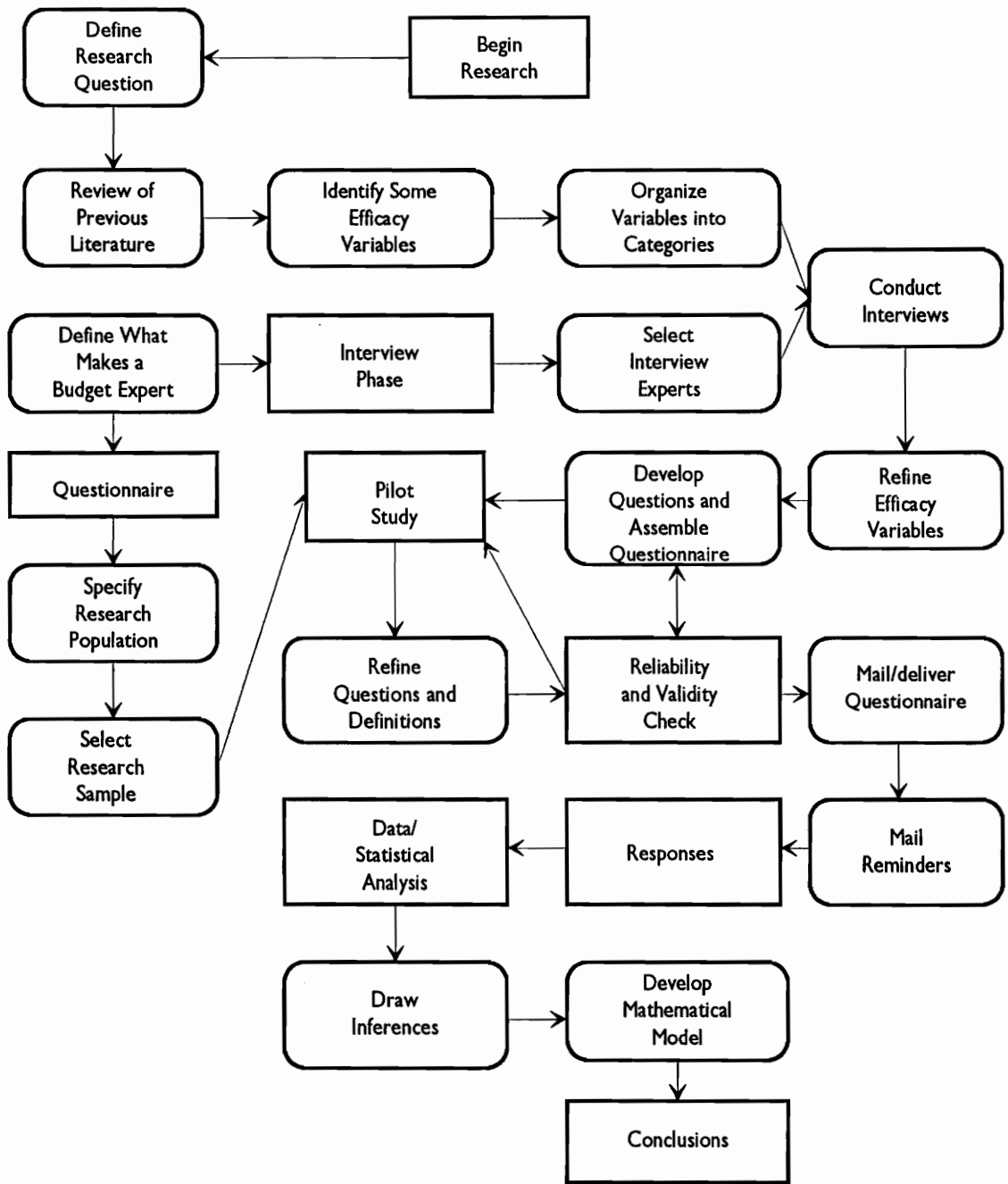
The approach utilized in this study was composed of four phases as shown in Table 2. Figures 5 and 6 portray the process flow diagram for the research approach and the corresponding timetable, respectively.

### **Phase 1. Literature Review**

The objective is to identify some efficacy variables to be used as primers for the second phase of the methodology. During this phase, the body of knowledge on management control systems and budgeting was researched to learn what variables contribute to budget efficacy. Additionally, relevant disciplines, such as management, engineering, psychology, and sociology were also investigate.

Once identified, the variables were organized into subcategories as they related to the following.

- a) The purpose of budgets. Every budget is unique in how it is used, and the purpose for which it is intended.
- b) The use of budgets. Budgets differ, not only in how they are utilized, but also in the features they offer users. These features determine, for example, the level of complexity, flexibility, cost, and utilization of budgets.



**Figure 5. Process Flow Diagram for Proposed Research**

**Table 2. Methodology Phases, Sources of Information, and Expected Output**

<b>Methodology Phase</b>	<b>Source of Information</b>	<b>Results</b>
1. Literature Review	Literature in the fields of Management, Psychology, Engineering, and Sociology.	A short list of efficacy variables used as a primer in the second phase of the methodology.
2. Personal Interviews	"Experts" opinions.	<ol style="list-style-type: none"> <li>1. Identification of other variables</li> <li>2. Clarification of possible confusion, and combination of redundant variables.</li> <li>3. Opinions on the importance of these variables.</li> </ol>
3. Questionnaire	Opinions of practitioners and researchers in the areas of budgets and management control systems.	<ol style="list-style-type: none"> <li>1. Ranking of the variables according to their importance.</li> <li>2. Identification of most important variables (top 20%) that could account for much (80%) of the efficacy of budgets as control systems.</li> <li>3. Assigning weights to the variables based on the responses to the questionnaire.</li> </ol>
4. Modeling	The weights and correlation factors calculated in questionnaire phase	A simple and linear mathematical model describing the efficacy of budgets as a function of the most important variables.

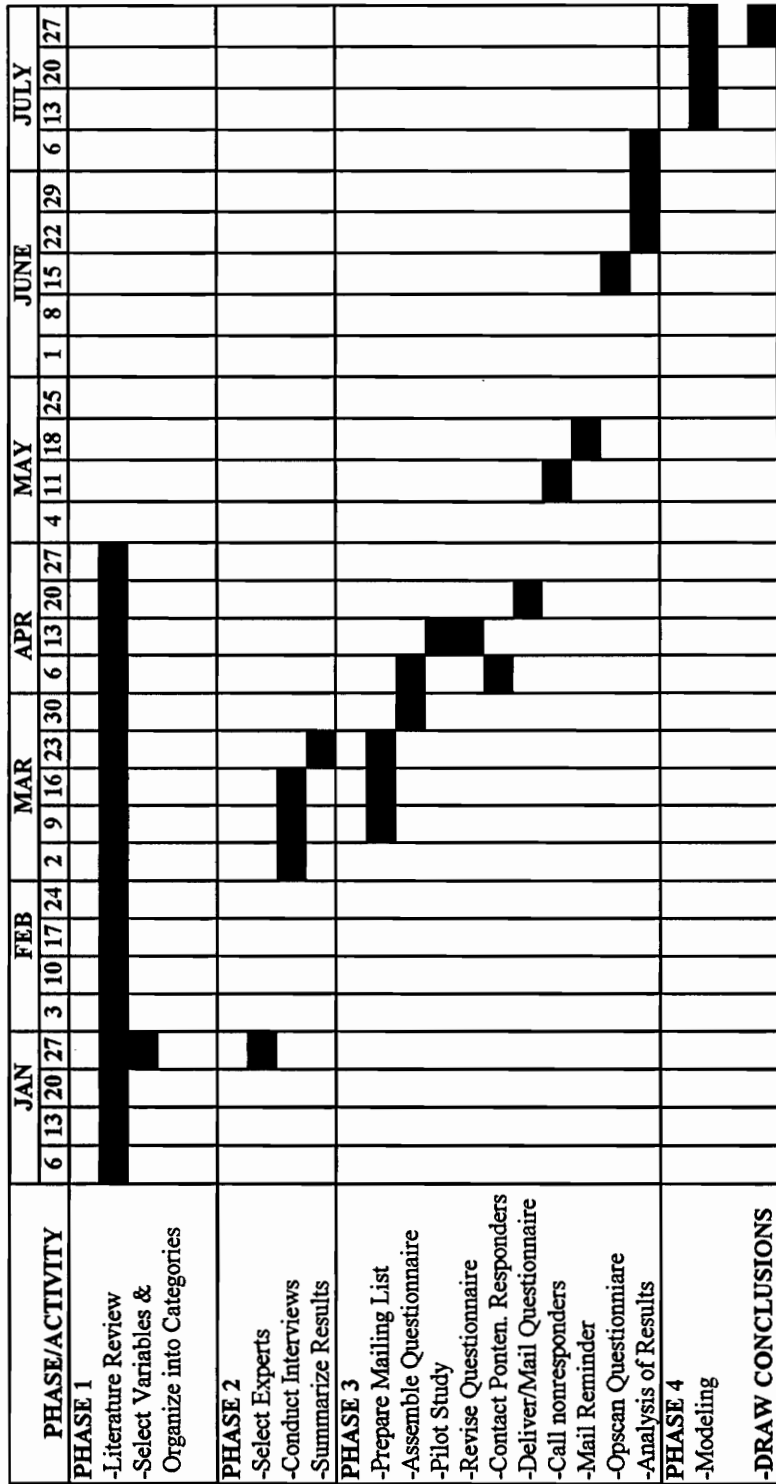


Figure 6. Timetable for Research Methodology

- c) Inherent characteristics of budgets and the budgeting cycle. All budgets attempt to allocate scarce resources among alternative courses of action. Furthermore, the budgeting cycle (planning-controlling-planning) is the same (or at least should be the same) for all budgets. Therefore, the degree of success for budgets could depend on how some of the features, inherent in the budget and its cycle, are utilized.

### ***Literature Review Results***

Researching the available literature revealed nineteen possible variables divided into the four major categories. The distinction between variables according to these categories was not always clear. However, these categories helped point out some variables that would have been missed otherwise. The following is a list of the identified variables affecting the efficacy of budgets.

#### **1) Related to budget purpose**

- a) The *impact budgets have* on accomplishing plans (critical contribution). That is, what contributions do budgets have in accomplishing plans?
- b) *Objectives* of budgets. Some budgets are prepared solely for control, while other budgets are needed to aid management in attainment of organizational goals.

#### **2) Related to use of budgets**

- a) *Cost/revenue* ratio of the use of budgets. In other words, would the benefits of budgeting outweigh its costs?
- b) The *responsiveness* of budgets to deviation from plans; how well do budgets detect and correct deviations from plans?

### **3) Related to budget characteristics and mechanics**

- a) *Flexibility*. Budgets are not ends in themselves. Budgets are first planning tools and then control tools.
- b) *Allowing changes* to budgets while maintaining the integrity of the purpose.
- c) *Time frame for preparing* budgets.
- d) *Previous budgeting practices*. Previous practices often leave traditions and supporters which might undermine efforts for changes.
- e) *Type of budget*.
- f) *Number of individuals and organizational levels* involved in preparing and maintaining the budget(s).
- g) *Budget horizon*.

### **4) Related to budget users**

- a) Level of *education/experience/training* for those who have the responsibility of *preparing budgets*.
- b) Level of *education/experience/training* for those who have the responsibility of *maintaining budgets*.
- c) *Management style*. Management can be autocratic or democratic, delegating or centralized, and/or approachable or distant.
- d) *Organizational structure*. Includes chain of command, size of the organization, number of management levels, number of employees, and whether or not labor unions are present in the company.
- e) *Type of business*. Would a manufacturing firm, for example, stand a better chance at effectively preparing and maintaining their budgets than a service firm?
- f) *Number of profit centers in relation to cost centers*. Budget complexity should increase as the number of profit centers increase.

- g) *The profitability/loss of the institution.* While 'sound' budgeting practices should result in higher profits (all things equal), the profitability of a company may afford it enough slack to ensure the effectiveness of its budget(s).
- h) *Level of dependence* the organization has *on* elements within its *environment*.

## Phase 2 Personal Interviews

The results of the literature review was used as a primer to solicit "experts"<sup>1</sup> opinions through personal interviews. The objectives of these interviews are to: a) allow these experts to contribute any additional variables they deem important, b) clarify and combine "similar" variables (in order to avoid semantics problems), and c) get a feel for which variables are most important and which ones are least important.

The interviews were structured around the following questions:

- I. Given the variables found, what other variables do you think are important when considering the efficacy of budgets as a control "system/mechanism"?
- II. Of the variables identified so far, a) which ones are not clearly understood by practitioners, and b) which ones can be combined?
- III. Of the remaining variables, which ones do you consider most important, and which ones are least important (list three variables in each case)?

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<sup>1</sup> An "expert" refers to a person with knowledge and skills. A person gains expert status through experience, training, reputation, and/or demonstrated ability. Experts vary in their knowledge or skills; some are better than others. In this phase of the research, the following characteristics were used to select these experts. An expert is someone who has had all of the following:

- a) Formal training in the area of budgeting. For researchers, a doctorate degree is desirable. Practitioners must have formal training during their career.
- b) A position where budgeting skills are constantly required. For researchers, teaching and/or research and publications in the area of budgeting is very important. Practitioners should hold positions requiring a great deal of their time preparing and maintaining budgets.
- c) At least 5 years experience working with management control systems and budgets.



### *Who Should be Interviewed?*

Since the results of the interviews were qualitative in nature, there was no objective way of determining how many experts should have been interviewed<sup>2</sup>. Common sense, however, dictated that one or two individuals were not enough to produce an unbiased and impartial list of efficacy variables. Furthermore, interviewing a large number of experts seemed to lend better credibility to the findings, but at the cost of time and resources. Therefore, three experts seemed to be the minimum number to interview during this phase.

Interviews included five experts; three researchers and two practitioners.

1. Mrs. Kathy Johnson. Mrs. Johnson is the budget director for the budget office at Virginia Tech. She is in charge of preparing and maintaining an annual operating budget exceeding \$400 million. Mrs. Johnson also worked in the budgeting division of Ford Motors Company before coming to Virginia Tech. In addition to her practical experience she teaches short courses in budgeting and business administration.
2. Mr. Mike Harness. Mr. Harness is the budget coordinator for the budget office at Virginia Tech. He has worked at this position since 1985. Prior to coming to VPI, he was the budget director at James Madison University (where he worked for 4 years).
3. Professor L. Killough. Professor Killough is the Peat Marwick Professor of Accounting and former department head. An accountant by training, Professor Killough developed a long-term interest in management control systems and conducted extensive research in that area.
4. Professor W. Leininger. Professor Leininger is currently the head of the accounting department. His position, training, and experience make him an ideal expert. By training and experience, Professor Leininger is well qualified to

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<sup>2</sup> The sample size is not particularly critical to this phase, since the purpose of the interviews is only to generate efficacy variables. Ranking the variables was done at a later point in the this research. The quality (knowledge and experience) of the experts was, therefore, more important than their number.

provide the needed insights into management control systems. Furthermore, his position as department head --which requires a great deal of his time working with budgets-- further boosts his credibility and legitimizes his inputs.

5. Dr. P. R. Sopariwala. Dr. Sopariwala is an assistant professor in the Accounting department. He has traditionally taught a course in management control systems with a strong emphasis on budgeting. Dr. Sopariwala has been very instrumental in recommending other experts.

### ***Interviewing Method***

While the individual interviews were conducted in an informal meeting, the following protocol was used for each.

1. Each expert was provided with a brief summary of the current research at least one week prior to meeting date. The summary included a description of the research domain, research objectives, and a summary of the research approach, a copy of the variables identified from the literature, and the list of questions they were requested to answer. A copy of the summary is included in appendix 6.
2. If possible, interviews were scheduled for a minimum of one hour.
3. Experts were, first, asked to express their opinions of the current research and the subject of budget efficacy. Each expert was also asked to respond to each of the questions; allowing ample time for them to elaborate and provide additional insights if they felt it was necessary.
4. The results of any interview did not affect the approach used in later ones.
5. Experts' responses were manually recorded. A tape recorder was used only for the first two interviews. It was decided not to continue using it because it seemed to restrain experts from speaking freely about budgets and their practices within Virginia Tech.

## *Interview Results*

While each interview followed the same structure, their time and the amount of volunteered information differed. Experts who are practitioners had a great deal more to say about budgets and their success than their counterparts in research. The duration of the interviews ranged from forty-five minutes to over two hours (some had to be continued at a later time). During the course of the interviews, it was apparent that some of the experts did not read the material sent to them, thus requiring interview time to explain research objectives and what was needed of them. Nevertheless, the resulting dialogue allowed the experts to express opinions they might not have been able to otherwise

Experts' statements (other than responses to the three questions listed above) were listed to try to find a common theme across them and attempt to summarize them in an understandable and coherent way. The collective opinions of the experts is summarized into four main topics<sup>3</sup>.

### **1. Prerequisites of budget success**

- a. Budget centralization and structure. The more centralization and structure is imposed on a budget, the more likely it will succeed. When budgets are decentralized too many exceptions exist; eventually overloading the control system and rendering it useless.
- b. Adequate control system. A good control system (in particular, accounting and information systems) must be in place to afford enough time to budget and monitor progress. Catering to crises detracts from effective planning and control (both reflected in the budget process).
- c. Allocation of adequate budgets. While this may seem too obvious to mention, many departments are often forced to "do more with less" making their budget destined to fail.

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<sup>3</sup> The selection of the topics was based on researcher's judgment after reviewing experts' responses and statements. The first three "topics" reflected statements made by at least two experts. The final topic included research-relevant statements made by any of the experts.

- d. When long-range plans are approved and accepted, goals are translated into short-term objectives, and a congruency of objectives exist between levels.
- e. Objectives and strategies are measurable and are tied to needed resources.
- f. Continuity of review. Deviation from plans can only be detected if actual resource allocation is compared to budget plans.
- g. Results and rewards. Proper rewards must be tied to actual outcomes as compared to budgets.

**2. A budget is considered successful when:**

- a. Spending does not exceed or fall below appropriated levels (overspending is as undesirable as under-spending).
- b. Appropriations are used as intended.

**3. Failures in planning and budgeting can be attributed to:**

- a. Virginia Tech is a labor intensive business. Practically everything involved constitute people; even its product (students). At the university level, budgeting is especially difficult since each student has an associated variable cost different from other students.
- b. Lack of knowledge by decision makers of what is required to implement a program or a plan.
- c. The people involved in decision making often make decisions based on subjective (political) reasons rather than fiscal policy.
- d. In higher education not many people really understand budgets.
- e. An apparent lack of linkages between strategic planning and management control systems. People are inclined to react only when they perceive benefits. Therefore it is difficult to think of long-term goals.
- f. Universities do not want to act like businesses.
- g. Budget management has always had a low priority.
- h. The continuous pressure by external constituencies to know how the university is spending its money. This sort of "meddling" often impedes actions that might provide long-term results.

#### 4. General statements regarding budgets and their success

- a. A budget is a financial plan. It tells the story of what is really important in an organization, and everything can be attributed to budgets. The budget serves as a road map and a point of measure to evaluate the performance of the institution.
- b. Budgets set up a structure for a plan to succeed. However, they do not guarantee its success.
- c. Benefits associated with budgets will always outweigh costs.
- d. Budget success is operationally defined as the achievement of short-term objectives of the long-range plans and the equitable distribution of resources.
- e. The economy plays an important role on the perspective of planning vs. control. The tighter the economy the more controls are exercised, and vice versa for planning.
- f. There is an inverse relationship between the size of an organization and the maintenance of its budget. The larger the organization, the less need for centralization and the greater the slack.

#### *Modified List of Efficacy Variables*

The combined result from literature review and experts' opinions yielded thirty variables that can affect the efficacy of budgets. At this phase of the research, the division between variables according to the proposed categories would only confuse potential responders.<sup>4</sup> The variables include the following.

1. Budget **responsiveness** to deviations from plans.
2. The **perception of importance** and the degree of its impact by those who have the responsibility of preparing and maintaining budgets.
3. Budget **response time**. The time between actual deviation from plans and the intervention needed to correct these deviations.

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<sup>4</sup> The categories served their purpose in helping to identify efficacy variables. However, many of the variables available now could easily belong to more than one category. A division between these variables might seem arbitrary to the responders.

4. **Budget flexibility.**
5. **Frequency of changes** in budgeting practices.
6. **Type and format of budget.** (i.e., incremental, zero base, variable budgets, etc.)
7. Level of **participation** in preparing and maintaining the budget.
9. **Budget horizon.**
10. Level of **education/experience, and training** for those who have the responsibility of **preparing** the budget.
11. Level of **education/experience, and training** for those who have the responsibility of **maintaining** the budget.
12. **Departmental structure** and complexity.
13. **Number of revenue centers in relation to cost centers.**
14. **Variety of sources of funds** (Income).
15. **Tying rewards** to successful budget preparation and maintenance.
16. The **availability of adequate funds.**
17. **Congruency of goals** and objectives.
18. Providing **adequate responsibility and accountability** for budget preparation and maintenance.
19. **Acceptance of long-term and short-term goals** by the various stockholders.
20. **Frequency of review** of budget performance.
21. **Management long-term and short-term focus.**
22. Availability of **budgetary slack.**
23. History of **successful performance** (reflected in the profitability/revenue of the department)
24. The intended **purpose** for a budget (planning or control).
25. **Costs and benefits** associated with using a budget.
26. **Time needed to prepare** a budget.
27. **Accounting system** used.
28. **Management/Supervisory style.**
29. The **general economy.**
30. The **nature of work** and the type of the department.

Experts were also requested to express their perceived importance of the variables. Each was requested to select three variables they could classify as "most important," and three

variables they felt were "least important" to budget efficacy<sup>5</sup>. Experts indicated that the "most important" variables were a) responsiveness, b) participation, c) perceived importance and impact, d) flexibility, e) tying rewards to successful budget preparation and maintenance, f) accounting system used, and g) availability of adequate funds. The "least important" variables, as perceived by the experts, were a) budget horizon, b) environmental factors, c) type of budget, d) level of education/experience, and training for budget preparation and maintenance, e) budget preparation time, and f) costs and benefits associated with using a budget.

### **Phase III. Questionnaire Phase**

The objective of the questionnaire is to determine which of the possible sets of variables are most important (most critical to the effectiveness of budgets). To do so, the modified set of variables were organized into a questionnaire and were sent to other budget experts<sup>6</sup>.

#### ***Questionnaire Design***

Originally, each variable was to correspond to only one question in the questionnaire. However, after reviewing the available variables, it was apparent that some variables are in fact constructs and should not receive equal treatment. Therefore the questionnaire was divided into two parts. Part I included variables that are uni-dimensional and can easily be associated to budget success. In part I, only one question was needed to solicit the perceived value and importance of each variable from the responders. Part II included

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<sup>5</sup> This request was made to obtain an initial feel of the importance of the variables, and to provide a measure of reliability to the research by comparing these variables to the results obtained from the questionnaire.

<sup>6</sup> These experts were not required to have the same in-depth knowledge of control systems and budgets as interview experts. They were individuals (practitioners) who have had experience (2-5 years) working with budgets.

constructs that could not accurately be assessed by only one question. Each construct in part II included a statement explaining it and two questions. The first question was designed to test if the construct had no impact on budgets, while the second question attempted to correlate (positively or negatively) budget success to the construct in general. In part II a responder was asked to select either question 1 or question 2 and then rank their selection according to the scale indicated.

The scale used for both parts of the questionnaire was a six-point ordinal scale (1-5)<sup>7</sup> ranging from "never" (1) to "always" (5). The sixth point on the scale (not applicable) was added to allow responders the option to indicate their inability to respond or if a question was stated in an inappropriate manner. A "not applicable" selection was treated as a no response during the analysis of the data. The scale was listed from the lower level to the higher in left-to-right order<sup>8</sup>

Finally, one question was included at the end of the questionnaire to inquire whether a department systematically prepares an annual budget. Three alternatives were given for this question 1) Always, 2) Sometimes, and 3) Never.

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<sup>7</sup> A five-point scale was chosen for the following reasons.

a) Psychometric research has shown that most subjects cannot reliably distinguish more than six or seven levels of response, and that for most scales a very large proportion of total score variance is due to direction of choice rather than intensity of choice. Offering four to five scale points is usually quite sufficient to stimulate a reasonably reliable indication of response direction; even for semantic differential items (Frery, 1991).

b) Giving the opportunity to respond at the scale midpoint can yield misleading results. The subject's choice of midpoint may be the result of ignorance, uncooperativeness, reading difficulty, reluctance to answer, or inapplicability of the question. However, a midpoint can provide a neutral response position, which is desirable for this questionnaire. Furthermore, the subjects for this part of the research are experienced and highly educated, and the questionnaire should present no risk to complete. These qualities should counter-balance the negative effect a scale midpoint can induce. In fact, it has been shown that when subjects truly have neutral beliefs (not ignorance), scale characteristics are improved by offering a neutral option.

<sup>8</sup> The proposed order is based on anecdotal evidence, but it seems plausible that associating greater response levels with lower numerals might be confusing for some responders (Frery, 1991).



The final questionnaire was transferred onto Opscan forms (shown in appendix 5) to facilitate data acquisition. Question numbers were modified to fit the Opscan form and to make it easier for responders to answer the questionnaire.

### ***Research Population***

VPI houses eight colleges and seventy-two departments. Each department has a department head, some have assistant department heads, and others also have an administrative manager. These individuals satisfied the requirements for an expert in this phase, and, therefore, ninety-four potential responders were identified from these departments. The list of potential responders and their corresponding departments is shown in Appendix 4.

### ***Pilot Study<sup>9</sup>***

The best questionnaires fall short when they are tested in the field. Many problems crop up which can render a questionnaire useless. Therefore, a convenient sample of five practitioners was chosen to examine the questionnaire and determine whether there was difficulty in understanding, determine relevance of the questions, and to learn the extent which there were problems in obtaining responses. This sample included

1. Mr. Benjamin Selvey; administrative officer of the Industrial and Systems Engineering Department.
2. Mr. Edward Sittler; projects manager of the Mechanical Engineering Department.
3. Ms. Rainel Otero; administrative officer at the Engineering Science and Mechanics Department.

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<sup>9</sup> Pilot studies should not be confused with a field trial of a tentative version of the questionnaire. A field trial will be desirable or necessary if there is substantial uncertainty in areas such as: a) response rate, b) question applicability or redundancy, and c) question performance (defective questions or sequence of questions may yield inconsistent responses) (Walizer & Wienir, 1978). Due to the unique nature of this research and time constraints, a field trial will not be done.

4. Dr. Charles P. Koelling; assistant department head of the Industrial and Systems Engineering Department.
5. Mr. Robert B. Frary; director and professor of the Office of Measurement and Research Services.

Each of the five practitioners was interviewed personally and was asked to critique the questionnaire. They were asked to point out difficulties in understanding any of the questions, or any inconsistencies in the questionnaire itself. Ms. Otero and Mr. Sittler were also requested to take time to answer the questionnaire. All of the practitioners in the pilot study agreed that the questionnaire was comprehensive, however, they recommended that the questions should be simplified to encourage potential responders to answer the questionnaire. Mr. Frary indicated that there might be some confusion regarding part II of questionnaire, simply because of its unusual form. Ms. Otero suggested using an alternative response scale ranging from "strongly agree" to "strongly disagree."<sup>10</sup>

Every effort was made to take into consideration the inputs from the pilot study in the final design of the questionnaire. All questions were simplified to the extent possible and without compromising the questionnaire. Part II was also explained in the questionnaire and the cover letter sent to each potential responder. However, the recommended changes in the scale were not put into effect to avoid the possibility of unsettling any segment of the responders.

### ***Questionnaire Dispatch and Collection Procedure***

The names, addresses, and relative information of the potential responders were organized into a database, from which a mailing list was generated. Each potential responder was given a code (1-94) to keep track of non-responders. The corresponding code was then affixed on the appropriate OpSCAN form. Each potential responder received

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<sup>10</sup> The use of such a scale may not bother some people at all, others find them objectionable. "Agree" is a very strong word, and some would say that "strongly agree" is redundant or at least a colloquialism. In addition, there is no comfortable resting place for those with some uncertainty. (Frary, 1991)

- a) a cover letter explaining the purpose of the questionnaire, emphasizing the importance of the research, and requesting his/her help. The letter also briefly pointed out the difference between questionnaire parts and how to respond to each. Appendix 4b shows a copy of the cover letter,
- b) a coded opscan form containing the questions, the response scale, and a brief explanation of the questionnaire, and
- c) a self-addressed return envelope.

Campus mail was used for sending and receiving the questionnaire. Prior to mailing, some responders<sup>11</sup> were contacted by phone to inform them of the upcoming questionnaire in the hope that such action would motivate these potential responders into responding to the questionnaire.

Once a questionnaire was received, the code was used to identify the responder in the database. Each questionnaire was examined to make sure all questions were answered and to check legibility for scanning machines. After two weeks from questionnaire mailing date, almost all non-responders were contacted by phone to remind them of the questionnaire. At the same time, a second mailing list was generated of these non-responders and reminders were sent to them. The reminders contained a coded questionnaire, a cover letter (reminding the responders of the first mailing and reemphasizing the importance of the research), and a self-addressed return envelope. Appendix 4c shows a copy of the cover letter used in the second mailing.

### *Questionnaire Results*

Potential responders were given three weeks from the second mailing date to return the questionnaire. A total of sixty-two responses were received in both mailings. Of these responses, only fifty were usable. The remaining responses included

- a) four responders who indicated that their position does not deal with budgets,

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<sup>11</sup> It was not possible to reach all responders by phone.

- b) seven responders who did not answer part II of the questionnaire according to instructions. These responders answered both questions for each variable instead of choosing only one, and
- c) one responder who refused to answer the questionnaire because the questions were considered too vague and ambiguous.

The opscan forms for the fifty usable responses were sent to the office of measurement and research services to be read through an Optical Mark Reader (OMR). The resulting data were then randomly checked to make sure they matched questionnaire responses. Inconsistencies were limited to part II of the questionnaire. This prompted a thorough comparison between the data available from the optical reader and the questionnaire.

Table 3 summarizes the data available from the fifty usable questionnaires. The columns in table 3 reflect the rating given to each question across the responders. Blank responses in part I were reported as a "not applicable" option of the rating scale. Blank responses in part II (questions 34 through 47) mainly reflect the requirement to rate only one question for each pair of questions.

Table 4 presents efficacy variables and their corresponding question number in the questionnaire. Table 5 provides descriptive information on questionnaire results. The number of responses, minimum and maximum values, mean, mode, variance, and standard deviations are listed for each of the questions. Table 6 presents the frequency distribution of the responses for each question, as well as, for questions 1 through 33, questions 34 through 47, and the combined distribution of all questions. Table 6 also shows the distribution of the responses as a percentage of the total responses for each question. Figure 7 graphically portrays the frequency distribution for questions 1-33 and questions 34-47.

The data shown in tables 5 and 6, and figure 7 lead to the following observations.

1. The modal values for most questions, shown in table 5, seem to approach 4. This observation is reinforced by the rightward skewness of the distribution of responses for both parts of the questionnaire as portrayed in figure 7.
2. With the exception of questions 16, 37, and 43, the distribution of the responses to each question covers at least four of the possible five-point response scale. This observation is important for using one-way analysis of variance (ANOVA).

ANOVA could not be used to analyze ordinal scale data if the responses for each question were limited to two or three points of the response scale.

3. The responses to question 48 indicate that only three out of forty-nine responders (approximately 6%) do not systematically prepare an annual budget. This result, however, seems to disagree with observations made during personal interviews; they expected a much larger proportion.



**Table 4. Summary of Efficacy Variables and Their Corresponding Question Numbers in the Questionnaire**

<b>Question</b>	<b>Measured Variable</b>	<b>Mean Response</b>
Q1	Responsiveness	3.980
Q2	Perception of Importance	4.020
Q3	Response Time	4.100
Q4	Flexibility	4.240
Q5	Frequency of Change	3.265
Q6	Type and Format of Budget	2.875
Q7	Participation	3.640
Q8	Number of Individuals and Levels Involved	2.980
Q9	Budget Horizon	3.500
Q10	Education, Experience, and Training/Preparing	3.900
Q11	Education, Experience, and Training/Maintaining	3.960
Q12	Structure and Complexity	2.880
Q13	Number of Revenue Centers in Relation to Cost Centers	2.787
Q14	Variety of Sources of Funds	3.640
Q15	Tieing rewards to successful budget preparation and maintenance	3.060
Q16	Availability of Adequate Funds	4.540
Q17	Congruency of Goals and Objectives	4.060
Q18	Giving Adequate responsibility and Accountability	4.080
Q19	Acceptance of Goals	3.820
Q30	Frequency of Review	3.520
Q31	Management Long-Term and Short-Term Focus	3.640
Q32	Budgetary Slack	3.420
Q33	History of Successful Performance	3.780
Q34	Independent of Budget Purpose (Planning vs Control)	3.233
Q35	Dependent on the Purpose of Budgets (Planning vs Control)	3.105
Q36	Independent of the Costs and Benefits Associated with Budget Use	3.552
Q37	Dependent on the Costs and Benefits Associated with Budget use	3.611
Q38	Dependent on Budget Preparation Time	3.526
Q39	Independent of Budget Preparation Time	3.200
Q40	Independent of the Accounting System Used	3.643
Q41	Dependent on the Accounting System Used	3.944
Q42	Independent of Management/Supervisory Style	2.615
Q43	Dependent on Management/Supervisory Style	4.162
Q44	Independent of the General Economy	3.467
Q45	Dependent on the General Economy	3.886
Q46	Independent of the Nature of Work and Type of Department	3.700
Q47	Dependent on the Nature of Work and the Type of Department	3.733
Q48	This Question Measures Departments' Dedication to Budget Preparation (1 = always, 2=Sometimes, and 3=Never)	1.320

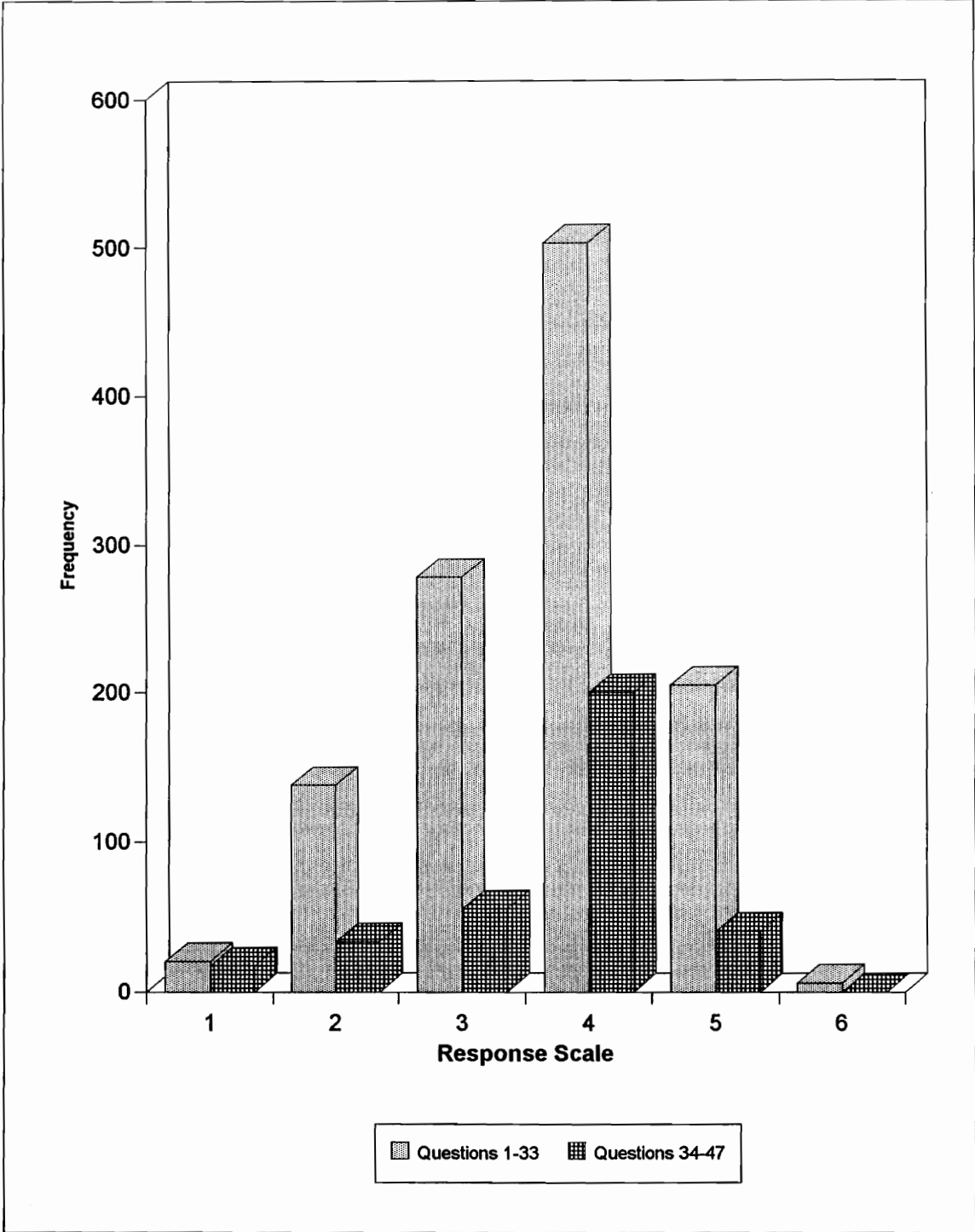
**Table 5. Discriptive Statistics for Questionnaire Results**

Question	Number of Responses	Minimum Value	Maximum Value	Mean	Mode	Variance	Standard Deviation
Q1	50	1	5	3.980	4	0.918	0.958
Q2	50	2	5	4.020	4	0.673	0.820
Q3	50	2	5	4.100	4	0.622	0.789
Q4	50	2	5	4.240	4	0.717	0.847
Q5	49	1	5	3.265	4	0.866	0.930
Q6	48	1	5	2.875	3	0.622	0.789
Q7	50	1	5	3.640	4	0.766	0.875
Q8	50	1	5	2.980	3	1.204	1.097
Q9	50	1	5	3.500	3	0.949	0.974
Q10	50	2	5	3.900	4	1.031	1.015
Q11	50	2	5	3.960	4	0.815	0.903
Q12	50	1	4	2.880	3	0.516	0.718
Q13	47	1	5	2.787	3	0.736	0.858
Q14	50	1	5	3.640	4	1.051	1.025
Q15	50	1	5	3.060	3	0.792	0.890
Q16	50	3	5	4.540	5	0.458	0.676
Q17	50	2	5	4.060	4	0.547	0.740
Q18	50	2	5	4.080	4	0.402	0.634
Q19	50	2	5	3.820	4	0.640	0.800
Q30	50	2	5	3.520	4	0.744	0.863
Q31	50	2	5	3.640	4	0.358	0.598
Q32	50	1	5	3.420	3	0.902	0.950
Q33	50	2	5	3.780	4	0.420	0.648
Q34	30	1	5	3.233	4	1.220	1.104
Q35	19	1	5	3.105	4	1.544	1.243
Q36	29	1	5	3.552	4	0.828	0.910
Q37	18	2	4	3.611	4	0.487	0.698
Q38	38	1	5	3.526	4	0.959	0.979
Q39	10	1	4	3.200	4	1.067	1.033
Q40	14	1	5	3.643	4	0.863	0.929
Q41	36	1	5	3.944	4	0.854	0.924
Q42	13	1	4	2.615	4	1.590	1.261
Q43	37	3	5	4.162	4	0.362	0.602
Q44	15	1	4	3.467	4	0.838	0.915
Q45	35	2	5	3.886	4	0.634	0.796
Q46	20	2	5	3.700	4	0.642	0.801
Q47	30	1	5	3.733	4	0.961	0.980
Q48	50	1	3	1.320	1	0.385	0.621



**Table 6. Frequency Distribution of Response and Their Percentage for Each Question in the Questionnaire**

Question	Possible Response										Total		
	1		2		3		4		5			6	
	n	%	n	%	n	%	n	%	n	%		n	%
Q1	1	2%	4	8%	5	10%	25	50%	15	30%			50
Q2	0		3	6%	7	14%	26	52%	14	28%			50
Q3	0		2	4%	7	14%	25	50%	16	32%			50
Q4	0		4	8%	1	2%	24	48%	21	42%			50
Q5	1	2%	10	20%	16	32%	19	38%	3	6%	1	2%	50
Q6	1	2%	14	28%	24	48%	8	16%	1	2%	2	4%	50
Q7	1	2%	4	8%	13	26%	26	52%	6	12%			50
Q8	4	8%	14	28%	15	30%	13	26%	4	8%			50
Q9	1	2%	6	12%	18	36%	17	34%	8	16%			50
Q10	0		8	16%	4	8%	23	46%	15	30%			50
Q11	0		6	12%	3	6%	28	56%	13	26%			50
Q12	1	2%	13	26%	27	54%	9	18%	0	0%			50
Q13	3	6%	12	24%	26	52%	4	8%	2	4%	3	6%	50
Q14	2	4%	6	12%	8	16%	26	52%	8	16%			50
Q15	2	4%	11	22%	20	40%	16	32%	1	2%			50
Q16	0		0	0%	5	10%	13	26%	32	64%			50
Q17	0		3	6%	3	6%	32	64%	12	24%			50
Q18	0		1	2%	5	10%	33	66%	11	22%			50
Q19	0		4	8%	9	18%	29	58%	8	16%			50
Q30	0		7	14%	15	30%	23	46%	5	10%			50
Q31	0		1	2%	18	36%	29	58%	2	4%			50
Q32	3	6%	1	2%	24	48%	16	32%	6	12%			50
Q33	0		4	8%	5	10%	39	78%	2	4%			50
<b>Total 1-33</b>	<b>20</b>	<b>2%</b>	<b>138</b>	<b>12%</b>	<b>278</b>	<b>24%</b>	<b>503</b>	<b>44%</b>	<b>205</b>	<b>18%</b>	<b>6</b>	<b>1%</b>	<b>1150</b>
Q34	3	10%	4	13%	8	27%	13	43%	2	7%			30
Q35	3	16%	3	16%	3	16%	9	47%	1	5%			19
Q36	1	3%	2	7%	9	31%	14	48%	3	10%			29
Q37	0		2	11%	3	17%	13	72%	0	0%			18
Q38	1	3%	6	16%	7	18%	20	53%	4	11%			38
Q39	1	10%	1	10%	3	30%	5	50%	0	0%			10
Q40	1	7%	0	0%	3	21%	9	64%	1	7%			14
Q41	1	3%	2	6%	4	11%	20	56%	9	25%			36
Q42	3	23%	4	31%	1	8%	5	38%	0	0%			13
Q43	0		0	0%	4	11%	23	62%	10	27%			37
Q44	1	7%	1	7%	3	20%	10	67%	0	0%			15
Q45	0		3	9%	4	11%	22	63%	6	17%			35
Q46	0		3	15%	1	5%	15	75%	1	5%			20
Q47	2	6%	2	6%	2	6%	22	71%	3	10%			31
<b>Total 34-47</b>	<b>17</b>	<b>5%</b>	<b>33</b>	<b>10%</b>	<b>55</b>	<b>16%</b>	<b>200</b>	<b>58%</b>	<b>40</b>	<b>12%</b>	<b>0</b>	<b>0%</b>	<b>345</b>
<b>Overall Tot.</b>	<b>37</b>	<b>2%</b>	<b>171</b>	<b>11%</b>	<b>333</b>	<b>22%</b>	<b>703</b>	<b>47%</b>	<b>245</b>	<b>16%</b>	<b>6</b>	<b>0%</b>	<b>1495</b>
Q48	38	78%	8	16%	3	6%							49



**Figure 7. Frequency Distribution of Responses Across the Response Scale for Questions 1-33 and Questions 34-47**

## ANALYSIS OF RESULTS

Questionnaire data were analyzed using release 606 of the SAS program on Virginia Tech's mainframe. The mainframe resides on an IBM 3084 model Q running the enhanced processor with 128 megabytes of storage. The following paragraphs detail the procedures used for the analysis of research results and the corresponding inferences and conclusions.

### Grouping Of Variables

One of the objectives of this research is to identify a small subset (top 20%) of the available variables which are considered by many of the responders (80% or more) to have a significant impact on budget success. In order for a variable to qualify for this subset, it must satisfy the following conditions

#### 1. Minimum Ranking

The variable should receive an average ranking of at least four on the five-point scale. As shown in table 7, variables corresponding to questions 16, 4, 43, 3, 18, 17, and 2 satisfy this condition. However, excluding any variable based on this condition alone is not statistically sound, especially since the difference between the mean response value for question 2 (4.02) and question 1 (3.980) is less than 1%.

#### 2. Population Representation

We should be at least 95% confident that the calculated means correctly represent the perception of the research population (in effect, choosing an alpha of 5%). The Signed Rank test was used to statistically test this condition for all variables. The results from

**Table 7. Ranking of Efficacy Variables According to Their mean Response**

Question	Measured Variable	Mean Response
Q16	Availability of Adequate Funds	4.540
Q4	Flexibility	4.240
Q43	Dependent on Management/Supervisory Style	4.162
Q3	Response Time	4.100
Q18	Giving Adequate responsibility and Accountability	4.080
Q17	Congruency of Goals and Objectives	4.060
Q2	Perception of Importance	4.020
Q1	Responsiveness	3.980
Q11	Education, Experience, and Training/Maintaining	3.960
Q41	Dependent on the Accounting System Used	3.944
Q10	Education, Experience, and Training/Preparing	3.900
Q45	Dependent on the General Economy	3.886
Q19	Acceptance of Goals	3.820
Q33	History of Successful Performance	3.780
Q47	Dependent on the Nature of Work and the Type of Department	3.733
Q46	Independent of the Nature of Work and Type of Department	3.700
Q40	Independent of the Accounting System Used	3.643
Q7	Participation	3.640
Q14	Variety of Sources of Funds	3.640
Q31	Management Long-Term and Short-Term Focus	3.640
Q37	Dependent on the Costs and Benefits Associated with Budget use	3.611
Q36	Independent of the Costs and Benefits Associated with Budget Use	3.552
Q38	Dependent on Budget Preparation Time	3.526
Q30	Frequency of Review	3.520
Q9	Budget Horizon	3.500
Q44	Independent of the General Economy	3.467
Q32	Budgetary Slack	3.420
Q5	Frequency of Change	3.265
Q34	Independent of Budget Purpose (Planning vs Control)	3.233
Q39	Independent of Budget Preparation Time	3.200
Q35	Dependent on the Purpose of Budgets (Planning vs Control)	3.105
Q15	Tieing rewards to successful budget preparation and maintenance	3.060
Q8	Number of Individuals and Levels Involved	2.980
Q12	Structure and Complexity	2.880
Q6	Type and Format of Budget	2.875
Q13	Number of Revenue Centers in Relation to Cost Centers	2.787
Q42	Independent of Management/Supervisory Style	2.615

this test for mean response ( $\mu$ ) equal to 3.0 and 4.0 are shown in table 8. The procedure for conducting the Signed Rank test is shown in appendix 3.

Testing for the mean response equal to 3.0 corresponded to the following null ( $H_0$ ) and alternative hypothesis ( $H_1$ )

$$\begin{array}{ll} \text{We wish to test} & H_0: \mu = 3 \\ & H_1: \mu > 3 \text{ [a one-sided test]} \end{array}$$

By rejecting  $H_0$  we can infer the question received an average ranking greater than 3.0 on the ordinal scale, and budget success is "almost always" dependent on the corresponding variable<sup>1</sup>.

As shown in table 8, twelve questions were excluded when testing for mean response equal to 3.0, and almost all variables (with the exception of variables corresponding to questions 4 and 16) were excluded when testing for mean response equal to 4.0. This condition, however, failed to provide a rationale for grouping the variables within an acceptable level of statistical significance.

### 3. Ranking Percentage

The variable should receive a minimum ranking of four by at least eighty percent of the responders<sup>2</sup>. Variables corresponding to questions 1, 2, 3, 4, 11, 16, 17, 18, 41, and 43 satisfy this condition.

The selection criterion of "significant efficacy variables" did not provide a statistically valid mean of grouping them. In fact, based on the available data, it is not even possible to say that the mean responses for the questions, and their corresponding variables, are statistically different from one another. To show statistical difference between mean

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<sup>1</sup> Testing for the mean response  $\mu$  equal to 4.0, we can conclude that budget success is "always" dependent on the corresponding variables when the null hypothesis is rejected.

<sup>2</sup> This condition is not as arbitrary as it seems. Its rationale is based in trying to identify a small subset of the available variables that are considered by many of the responders (80% or more) to have a significant impact on budget success.

**Table 8. Signed Rank Test Results Showing Which Question's Mean Response is Representative of the Research Population**

Question	M = 3					M = 3					Sum of Ranks	Decision	
	n	A n(n+1)/2	B A(n,0.5)	A-B	n	A n(n+1)/2	B A(n,0.5)	A-B	n				
Q1	45	1035	371	664	25	325	100	225	25	157.5	157.5	reject	Not Reject
Q2	43	946	336	610	24	300	91	209	24	154	154	reject	Not Reject
Q3	43	946	336	610	25	325	100	225	25	192	192	reject	Not Reject
Q4	49	1225	446	779	26	351	110	241	26	241.5	241.5	reject	reject
Q6	34	595	151	444	30	465	151	314	30	30	30	Not Reject	Not Reject
Q7	26	351	110	241	40	820	286	534	40	13	13	Not Reject	Not Reject
Q8	37	703	241	462	24	300	91	209	24	60	60	reject	Not Reject
Q9	35	630	213	417	37	703	241	462	37	40	40	Not Reject	Not Reject
Q10	32	528	175	353	33	561	187	374	33	108	108	reject	Not Reject
Q11	46	1081	389	692	27	378	119	259	27	150	150	reject	Not Reject
Q12	47	1128	407	721	22	253	75	178	22	110.5	110.5	reject	Not Reject
Q13	23	276	83	193	41	861	302	559	41	0	0	Not Reject	Not Reject
Q14	24	300	91	209	43	946	336	610	43	29	29	Not Reject	Not Reject
Q15	32	528	175	353	24	300	91	209	24	68	68	reject	Not Reject
Q16	30	465	151	314	34	595	200	395	34	11	11	Not Reject	Not Reject
Q17	45	1035	371	664	37	703	241	462	37	608	608	reject	reject
Q18	47	1128	407	721	18	171	47	124	18	96	96	reject	Not Reject
Q19	45	1035	371	664	17	153	41	112	17	93.5	93.5	reject	Not Reject
Q20	41	861	302	559	21	231	67	164	21	72	72	reject	Not Reject
Q30	35	630	213	417	27	378	119	259	27	52.5	52.5	reject	Not Reject
Q31	32	528	175	353	21	231	67	164	21	21	21	reject	Not Reject
Q32	26	351	110	241	34	595	200	395	34	93	93	reject	Not Reject
Q33	45	1035	371	664	11	66	13	53	11	2	2	reject	Not Reject
Q34	22	253	75	178	17	153	41	112	17	11	11	Not Reject	Not Reject
Q35	18	171	47	124	12	78	17	61	12	2.5	2.5	Not Reject	Not Reject
Q36	20	210	60	150	15	120	30	90	15	19.5	19.5	reject	Not Reject
Q37	15	120	30	90	5	15	0	15	5	0	0	reject	Not Reject
Q38	31	496	163	333	18	171	47	124	18	24	24	reject	Not Reject
Q39	7	28	3	25	5	15	0	15	5	0	0	Not Reject	Not Reject
Q40	12	78	17	61	6	21	2	19	6	2.5	2.5	Not Reject	Not Reject
Q41	32	528	175	353	16	136	35	101	16	63	63	reject	Not Reject
Q42	12	78	17	61	8	36	5	31	8	0	0	Not Reject	Not Reject
Q43	33	561	187	374	14	105	25	80	14	75	75	reject	Not Reject
Q44	12	78	17	61	5	15	0	15	5	0	0	Not Reject	Not Reject
Q45	31	496	163	333	13	91	21	70	13	33	33	reject	Not Reject
Q46	20	210	60	150	6	21	2	19	6	1.5	1.5	reject	Not Reject
Q47	29	435	140	295	9	45	8	37	9	7.5	7.5	reject	Not Reject

responses, therefore, one-way analysis of variance must be performed. However, part II of the questionnaire complicates this analysis, since two questions were asked to assess each variable. To overcome this problem, we must show the proportion of responses for one of the questions is significantly greater than the other<sup>3</sup>, then select that question as a representative of the variable in the one-way analysis of variance.

### *Proportional Testing*

Since each responder was allowed to answer only one of the questions (for questions 34 through 47), each response could be treated as a Bernoulli trial. The sum of trials across responders should be distributed according to a Binomial distribution. To test for a significant difference between the responses for the questions in each variable, the normal distribution was used as an approximation to the binomial distribution. The results of this test are shown in Figure 8.

Questions 34, 35, 36, 37, 46, and 47 were not shown to be statistically different. One could, therefore, conclude that the variables corresponding to these questions are not important since responders could not agree on one of the choices<sup>4</sup>. The variables corresponding to these questions, therefore, were not included in the analysis of variance. On the other hand, responses for questions 38, 41, 43, and 45 were shown to be significant. We could, therefore, conclude that these questions reflect the opinion of the majority of the responders. These questions were included in the analysis of variance.

### *Analysis of Variance*

A one-way ANOVA procedure was used to test for the statistical difference between mean responses of questions 1 through 34 and questions 38, 41, 43, and 45. Using the

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<sup>3</sup> In other words, we must statistically show that the ratio of the number of responses for one of the questions over total responses for the variable is significantly greater than 50%.

<sup>4</sup> It is also possible that the questions for these variables were misleading or inappropriately phrased.

Test The Hypothesis:

$H_0: P = P_0 = .5$

$H_1: P \neq P_0$

For  $\alpha = .05$

Reject  $H_0$  if:

$|Z_{obs}| > Z = 1.96$

$$Z_{obs} = (P - P_0) / \sqrt{P_0(1 - P_0) / n}$$

The Normal Distribution Provides a Good Approximation to the Binomial Distribution as Long as:

$$[P_0(n), (1 - P_0)(n)] > 5$$

RESULTS						
Question	n	Y	P	[P <sub>0</sub> (n), (1-P <sub>0</sub> )(n)]	Z <sub>obs</sub>	Decision
Q34	49	30	61.22%	24.5	1.571	Not Reject
Q35	49	19	38.78%	24.5	1.571	Not Reject
Q36	47	29	61.70%	23.5	1.605	Not Reject
Q37	47	18	38.30%	23.5	1.605	Not Reject
Q38	48	38	79.17%	24.0	4.041	Reject
Q39	48	10	20.83%	24.0	4.041	Reject
Q40	50	14	28.00%	25.0	3.111	Reject
Q41	50	36	72.00%	25.0	3.111	Reject
Q42	50	13	26.00%	25.0	3.394	Reject
Q43	50	37	74.00%	25.0	3.394	Reject
Q44	50	15	30.00%	25.0	2.828	Reject
Q45	50	35	70.00%	25.0	2.828	Reject
Q46	50	20	40.00%	25.0	1.414	Not Reject
Q47	50	30	60.00%	25.0	1.414	Not Reject

Figure 8. Using the Normal Distribution to Test Whether the Frequency of Responses for Questions 34-47 are Proportionally Distributed Between Each Pair of Questions



responses for each question across responders as the dependent variable, the ANOVA compared the variation of responses within each question to the variation of responses between questions. The procedure for the one-way ANOVA is explained in appendix 3.

The results from the ANOVA is shown in Figure 9. They indicated that at least one of the mean responses of the variables is statistically different from the others. The results, however, do not indicate which means are equal and which means are different. To do so, a post-hoc procedure was employed.

### ***Multiple Range Test***

Multiple range testing provides the possibility of grouping the variables according to their mean responses. It does so by, first, ranking the variables in ascending order of their mean response, and then making repeated pair-wise comparisons across the range of the means. For each pair-wise comparison, the null and alternative hypothesis are

$$H_0: \mu_i = \mu_j,$$

$$H_1: \mu_i \neq \mu_j$$

By rejecting  $H_0$  we can conclude that all variables between and including variable  $i$  and variable  $j$  have mean responses not significantly different from the rest in the group.

Tukey's multiple range test<sup>5</sup> procedure, shown in appendix 3, was used and the results are shown in table 9. The variables were grouped into ten statistically different groups (A through J). The difference between the mean response for each variable in any one group is not significant. It is, therefore, possible to infer that such variables have relatively equal

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<sup>5</sup> Many researchers prefer Duncan multiple range test because of its greater power, without realizing that this increased power is attained by increasing type I error rate. Tukey's test, while more conservative, is designed to control type I error rate.

Test the Hypothesis: Ho: M1 = M2 = M3 = ..... = Mn H1: At least One of the Mean Responses is Different From the Others					
			For a = .05 Reject Ho if: F Value > F(26, 1289)		
Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value	F(26, 1289)
Model (Between)	26	267.37	10.284	14.17	1
Error (Within)	1263	916.29	0.726	PR > F = 0.0001	
Total (Corrected)	1289	1183.66			
R-Square		C.V.	Root MSE	Dependent Variable Mean	
0.2259		23.215	0.8518	3.669	

Figure 9. Analysis of Variance for Mean Responses of Questions 1-33 and Questions 38, 41, 43, and 45

**Table 9. Multiple Range Test Results Showing Tukey's Grouping of Questions With Mean Responses Not Statistically Different From the Rest in the Group**

Question	Mean	N	Tukey's Grouping									
			A	B	C	D	E	F	G	H	I	J
Q16	4.540	50	A									
Q4	4.240	50	B									
Q43	4.162	37	C									
Q3	4.100	50	D									
Q18	4.080	50	E									
Q17	4.060	50	E									
Q2	4.020	50	E									
Q1	3.980	50	E									
Q11	3.960	50	E									
Q41	3.944	14	E									
Q10	3.900	50	E									
Q45	3.886	35	F									
Q19	3.820	50	F									
Q33	3.780	50	F									
Q7	3.640	50	F									
Q14	3.640	50	F									
Q31	3.640	50	F									
Q38	3.526	38	F									
Q30	3.520	50	F									
Q9	3.500	50	F									
Q32	3.420	50	F									
Q5	3.265	49	F									
Q15	3.060	50	F									
Q8	2.980	50	F									
Q12	2.880	50	F									
Q6	2.875	48	F									
Q13	2.787	47	F									

(comparable)<sup>6</sup> rating by responders. Tukey's test results, however, do not make it possible to clearly distinguish between groups. Group overlap creates inconsistencies whereby several variables could belong to more than one group. By virtue of the test, all variables within a group should be relatively equal, however, the results indicate the possibility of having illogical equalities between variables. For example, variables corresponding to questions 41, 10, and 45 belong to two groups; A and B. Questions 41 and 10 belong to group A, while questions 10 and 45 belong to group B. Therefore, questions 41 and 10 should be equal and questions 10 and 45 should also be equal, but questions 41 and 45 are not equal; which is illogical. Similar inconsistencies exist in groups B through J.

### *Identifying Significant Variables*

Inconsistencies in Tukey's test results, while important and must be kept in mind, should not present serious problems for this research. We are interested in finding a small group of variables considered by many responders to have significant impact on the efficacy of budgets. Tukey's results indicate that variables corresponding to questions 16, 4, 43, 3, 18, 17, 2, 1, 11, 41 and 10 might be this group. They all belong to group A and have mean responses relatively equal to one another. These variables also have the highest mean response of all variables and satisfy all the conditions for the selection of the most significant variables<sup>7</sup>. Therefore, according to the Pareto principle, these variables may be considered the subset of total variables (approximately 33%) that account for the majority (at least 80%) of the impact on the efficacy of budgets. Overlaps by other groups, mainly groups B through F, should not change the drawn conclusion since such overlaps do not require elimination of any previously mentioned variables or the addition of new ones.

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<sup>6</sup> Having variables' mean response not significantly different from the rest in the group does not mean such variables are equal. However, since the difference is not very large, we can assume responders' perception of variables' importance is the same for each variable in any one group.

<sup>7</sup> Question 10 reflects the only variable failing to satisfy the condition of at least 80% of the responders giving it a minimum ranking of (4) on the five-point response scale. Instead, 74% of the responders ranked at either (4) or (5). The difference, however, is not considered significant enough to warrant excluding the variable from the group since it qualifies on all other factors.

## Correlation Between Variables

We must now provide a means of modeling the efficacy of budgets as a function of the most important variables. To do so, however, requires assessment of the relationships between these variables. Correlation analysis, while not indicative of the cause and effect relationships between variables, reflects the possible associations between them<sup>8</sup>.

The Pearson correlation coefficient was used to assess the correlation between the responses of each question across the responders for questions 1 through 33 and questions 38, 41, 43, and 45. Correlation analysis results are shown in Table 10<sup>9</sup>. Based on the results, the following observations can be made

1. For the most part, variables are positively correlated. Negatively correlated variables represent only 22% of overall correlation, and the majority of them have coefficients less than 0.2. The lack of negative (significant) correlation may be attributed to how questions were phrased in the questionnaire. With the exception of questions 5, 12, and 13, all other questions requested the responders to indicate their level of agreement on how the variables positively influence budget success. Furthermore, it is the researcher's opinion that most variables (with the exception of variables corresponding to questions 5, 12, and 13) should have a positive influence on budget success. Therefore, the association between the variables should also be positive.
2. The highest correlation coefficient was found between questions 10 and 11 (0.73)<sup>10</sup>. This may reflect responders' belief that individuals who have the responsibility of preparing budgets are also responsible for maintaining it; this belief may not be true

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<sup>8</sup> The research assumes that since the questions are correlated, the corresponding variables should also be correlated.

<sup>9</sup> Excluding questions 34 through 37 and questions 39, 40, 42, and 44 from correlation analysis is based on the assumption that these questions were not considered important by the majority of the responders (refer to Proportional Testing Section). These questions might also have been misleading to the responders. In either case, including these questions in correlation analysis would have produced erroneous results.

<sup>10</sup> While correlation analysis in this study ascertains the associations between questions, the inference can be made that the variables corresponding to these questions reflect the same associations as well.

Table 10. Correlation Between Responses for Each Question Across Responders

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q30	Q31	Q32	Q33	Q38	Q41	Q43	Q45	
Q1	1.00																											
Q2	0.26	1.00																										
Q3	0.43	0.23	1.00																									
Q4	-0.08	0.07	0.10	0.21	1.00																							
Q5	0.05	0.14	0.26	0.20	0.05	1.00																						
Q6	0.04	0.12	0.11	-0.13	-0.20	0.09	1.00																					
Q7	0.10	0.09	-0.12	-0.04	-0.36	0.05	0.42	1.00																				
Q8	0.08	0.19	0.25	0.07	-0.14	0.13	0.43	0.43	1.00																			
Q9	0.19	0.27	0.27	0.43	0.02	0.17	0.10	0.00	0.15	1.00																		
Q10	0.21	0.11	0.21	0.08	0.08	0.23	0.14	0.02	0.14	0.00	1.00																	
Q11	0.09	0.21	0.13	0.12	0.14	0.19	0.09	-0.11	0.00	0.07	0.12	1.00																
Q12	0.20	0.12	0.27	0.13	0.35	0.21	0.04	0.00	0.16	0.17	0.13	0.26	1.00															
Q13	0.05	-0.06	0.22	0.15	0.09	0.10	-0.01	-0.13	0.14	0.30	0.18	0.11	0.10	1.00														
Q14	0.17	0.03	0.08	0.09	-0.08	-0.03	0.11	0.11	0.18	0.30	0.31	0.17	0.09	0.40	1.00													
Q15	-0.05	0.02	0.13	-0.12	0.07	-0.04	-0.12	0.08	0.23	0.00	0.05	0.15	0.23	0.22	1.00													
Q16	0.35	0.44	0.30	0.09	0.09	0.05	-0.12	0.00	0.10	0.44	0.09	0.17	0.05	0.27	0.18	0.06	1.00											
Q17	0.37	0.31	0.27	0.38	-0.10	0.01	-0.02	0.15	0.10	0.33	0.26	-0.07	-0.12	0.20	0.24	0.14	0.00	1.00										
Q18	0.29	0.38	0.35	0.34	0.08	0.10	0.34	-0.05	0.17	0.40	0.39	0.03	0.09	-0.13	0.16	-0.01	0.26	0.27	1.00									
Q19	0.16	0.16	0.16	-0.06	-0.14	-0.03	0.25	-0.03	-0.12	0.13	0.26	0.00	-0.11	0.10	-0.01	-0.04	0.17	0.22	0.17	1.00								
Q30	0.20	0.35	0.25	0.25	-0.13	-0.01	0.10	0.21	0.42	0.31	0.16	-0.10	0.23	0.18	0.08	0.14	0.42	0.08	0.29	0.13	1.00							
Q31	-0.17	-0.01	-0.25	-0.08	0.10	0.08	0.11	-0.03	0.21	-0.06	-0.08	-0.19	-0.03	0.16	-0.15	0.12	-0.15	-0.16	-0.11	0.08	0.09	1.00						
Q32	0.29	0.05	0.20	0.40	-0.17	-0.09	0.00	-0.01	-0.02	0.00	0.00	-0.15	-0.05	0.19	0.16	0.09	0.00	0.29	0.28	0.35	0.16	-0.11	1.00					
Q33	0.28	0.14	0.07	-0.12	0.08	0.09	0.28	0.29	0.21	0.04	0.05	0.15	0.24	0.16	0.10	0.04	0.13	0.08	-0.03	0.14	0.20	-0.18	-0.18	1.00				
Q38	0.37	0.33	0.35	-0.06	-0.18	0.08	0.33	0.27	0.27	-0.01	0.02	0.32	0.34	0.04	-0.10	0.00	0.18	0.17	0.14	0.34	0.02	-0.03	0.00	1.00				
Q41	0.26	0.40	0.18	-0.04	-0.06	-0.27	0.15	0.14	0.15	-0.11	-0.13	-0.24	0.16	-0.39	-0.33	0.00	0.12	0.09	0.02	0.17	0.19	-0.03	0.01	0.26	1.00			
Q43	-0.08	0.43	0.12	0.19	0.13	0.33	0.09	0.09	0.09	0.43	0.44	0.33	-0.11	0.16	0.19	0.03	-0.14	0.42	0.13	0.07	0.09	0.14	-0.08	0.32	-0.07	1.00		
Correlation With Total	0.42	0.48	0.5	0.4	0.03	0.26	0.35	0.13	0.37	0.56	0.53	0.2	0.34	0.24	0.26	0.13	0.51	0.36	0.43	0.25	0.44	-0.1	0.34	0.29	0.53	0.06	0.44	

Shaded Cells Indicate Correlation Coefficients Greater than or equal to 0.45

in all cases. Other significant correlation coefficients ( $r > 0.6$ ) include those between question 33 and questions 10 and 11 and between questions 38 and 41.

3. Correlation between each of the questions and all other questions indicate the amount of information the question conveys which is not attainable from other questions in the questionnaire. High correlation coefficients suggest that the information obtained from the question may also be obtained (at least in part) from other questions in the questionnaire. On the other hand, low correlation with total implies the question has unique input not possible from the other questions. Questions 5, 32, and 43 have significantly lower correlation with total than any other question in the questionnaire.
4. Normally, correlation coefficients of 0.0 indicate the variables are not correlated at all. However, the likelihood of getting exactly 0.0 correlation is very small. Nevertheless, correlation results showed three incidents where a correlation coefficient of 0.0 was found; between questions 9 and 12, 11 and 16, and 7 and 33. Considering the number of responders and questions involved, a zero correlation should be nearly impossible. This unrealistic correlation may be attributed to many reasons. First, it is possible the correlation is not exactly 0.0. Since the results shown in Table 10 uses only two decimal points, utilizing more decimal points might prove otherwise. This was the case for the correlation between questions 11 and 16 and 7 and 33. Zero correlation coefficients may also be attributed to how the questions were phrased. Closer examination of how questions 9 and 12 were phrased suggests it may be possible not to have any association between them.

### **Modeling Budget Efficacy**

The data presented in Table 10, while informative, is overwhelming. Data reduction was necessary to understand significant associations between variables. Social scientists often consider a correlation coefficient significant if it is greater than or equal to 0.4. At this level of significance, the data revealed thirty six relationships between twenty seven variables. The number of relationships and variables involved made it difficult to summarize this information in a coherent manner. Increasing the level of significance to

0.45, however, reduced the number of associations to a manageable number of 20 associations between 17 variables<sup>11</sup>. This information is depicted in Figure 10.

Modeling not only requires knowledge of the possible associations between variables, but also the direction and the degree of the associations. Correlation describes the strength of the relationship between one variable and another. One variable correlates meaningfully with another only when the bond links both variables in a logical and causal relationship. If there is a strong association between two variables, knowing one helps in predicting the other. Correlation, however, does not indicate the direction of the relationship nor is it the same as causation.

Figure 10 effectively provides a schematic model of the relationships between seventeen variables; including ten "most significant" variables. The available body of knowledge in this area, however, does not help point out the direction of these relationships. Attempts to describe these relationships have so far been based on intuitive feel and anecdotal evidence. Consequently, modeling budget efficacy was limited to a general mathematical function<sup>12</sup>, and only included the subset of variables earlier defined as "most important." The general mathematical model is expressed as

$$\text{Efficacy of Budgets (E)} = f\{\text{AF, F, MS, RT, AR, CG, PI, R, ME, AS, PE}\}$$

Where;

AF	Availability of Adequate Funds
F	Flexibility
MS	Management/Supervisory Style
RT	Response Time
AR	Adequate Responsibility & Accountability
CG	Congruency of Goals

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<sup>11</sup> Choosing 0.45 as the level of significance is not statistically supported. The choice was made based on 5% increments to what is normally considered significant correlation in social sciences.

Furthermore, the number of correlation became more manageable at coefficients of 0.45 than 0.40.

<sup>12</sup> This type of function is often referred to as a decision evaluation function. Thus, budget efficacy is the evaluation measure (E) derived from a decision evaluation function ( $f\{x,y,z,\dots\}$ ). This evaluation function is a mathematical model formally linking budget efficacy with controlled decision variables, and parameters that cannot be controlled by the decision maker (Blanchard & Fabrycky, 1990).



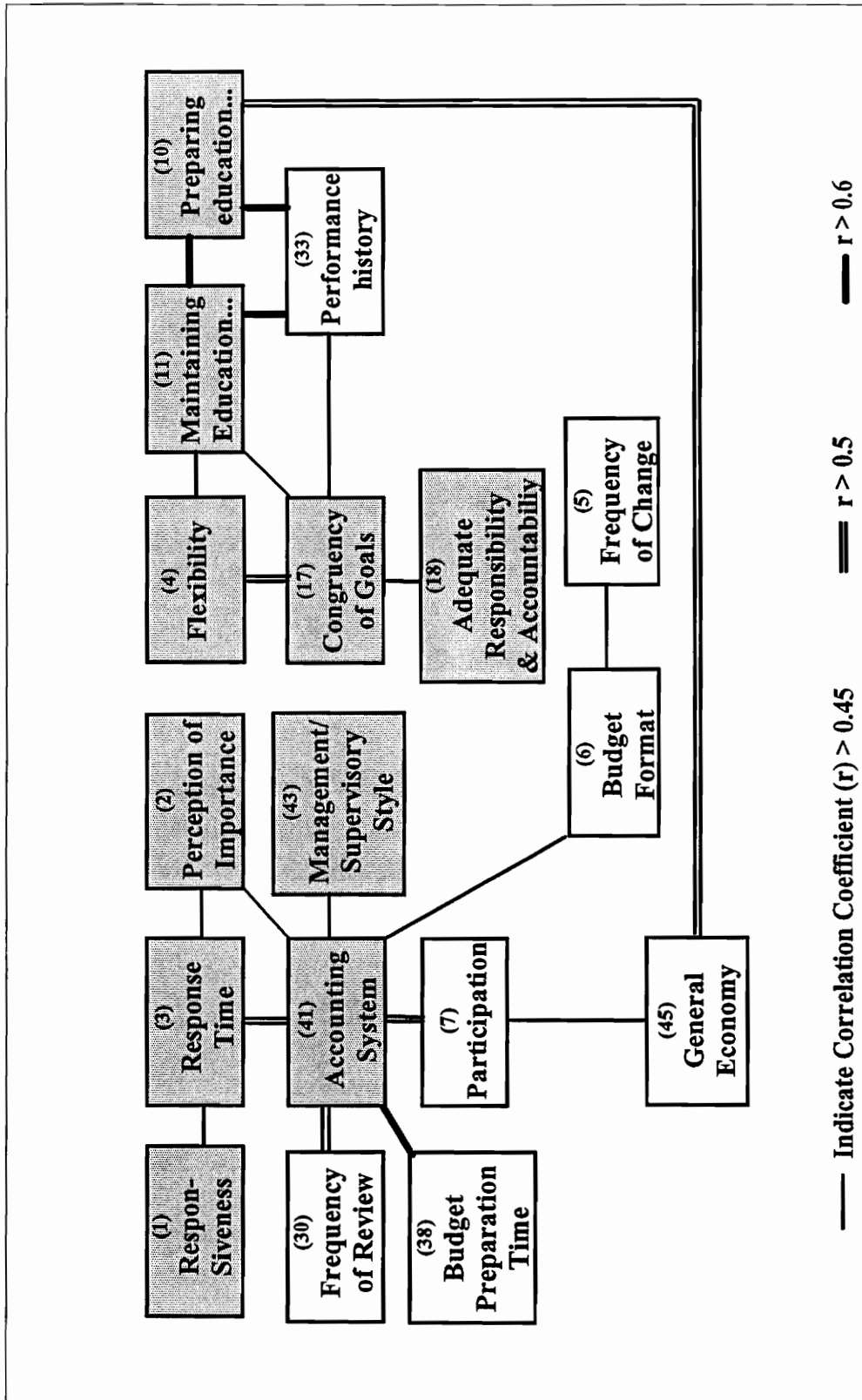


Figure 10. Correlation Diagram For Efficacy Variables Depicting Correlation Coefficient (r) > .45  
 (shaded boxes reflect "most significant variables")

PI	Perception of Importance
R	Responsiveness
ME	Maintaining Education
AS	Accounting System
PE	Preparing Education

Despite the shortcoming of the schematic model presented in figure 10, it portrays logical and acceptable relationships between the variables involved. Each of these relationships can be rationalized; at least based on experience or common sense. Yet, the model fails to explain how or why are the variables related. The direction of many relationships is not clear. For example, whether the accounting system used affects the frequency of budget review or vice versa is not clear. Arguments for each scenario are acceptable<sup>13</sup>, but without any empirical evidence to back either. Nevertheless, this model is valuable in understanding budget efficacy once the direction of the association between variables can be empirically determined.

## **Research Validity and Reliability**

Research validity should be the first issue any research must address. Valid research meets its objectives by employing a sound methodology, utilizing appropriate measurement instruments, and applying proper techniques in analyzing the results. There is no direct way to assess validity, ultimately we have to rely on judgment.

There are several types of validity. The following were addressed in this research

### **1. Face Validity**

Face validity is concerned with a) whether the incorporated methodology (including interviews and questionnaire) measured what it was supposed to measure, and b) the

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<sup>13</sup> Since the accounting system serves as an umbrella for such control systems as budgets, constraints within the accounting system dictate how or when budgets are reviewed. On the other hand, if management feels a need to specify the nature and timing of budget review, the accounting system must change to accommodate such demands.

adequacy and representation of population. Methodology phases were designed so that their combined outcome satisfy research objectives. Literature review and interview phases were intended to provide a "comprehensive" list of variables affecting budget efficacy. The questionnaire, on the other hand, was designed to assess responders' evaluations of the importance of each of these variables to rank them in order of their perceived importance. Finally, the modeling phase incorporated inputs from the other phases to provide schematic and mathematical models of budget efficacy. Therefore, the researcher believes the methodology did measure what it was supposed to do.

For the representation of the research population, two issues were addressed. First, the question of whether potential responders were qualified enough to serve as "experts" was resolved by setting guidelines for their selection. Potential responders were selected based on their position, as well as their knowledge and experience dealing with budgets<sup>14</sup>. Second, the issue of sample size was resolved by selecting the entire population in this case study. It is generally advised to poll the entire population rather than to sample when confronted with a small population, as the case in this research. Small populations require a larger percentage of response to generate the same accuracy larger populations would have with less percentage of responses. For example, a random sample of 132 is required for a population of 200 to achieve the same accuracy that a random sample of 384 will provide for a population of one million (Frary, 1991).

## **2. Content Validity**

Content validity deals with how accurately the questions asked tend to elicit the information sought. The questions asked during interviews are fairly straight forward. They directly reflect the objectives of the research. Consequently, the validity of their contents require little -if any- evaluation. The pilot study, on the other hand, was conducted to address this form of validity for the questionnaire. Requesting a small and representative sample to evaluate the questionnaire insured the validity of the questions in eliciting the information sought.

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<sup>14</sup> In many cases, however, assumptions had to be made regarding responders' knowledge and experience when such information is not available. These assumptions were based on the position of the potential responder.

### **3. Internal Validity**

Internal validity is concerned with the manner in which the research was designed does not affect its outcome. Every effort was made to avoid introducing any form of bias throughout the research. During interviews, the researcher refrained from making value-laden remarks that might affect experts' responses. All interviews had the same structured formats, and the outcome of the interviews did not affect how later interviews were conducted. The questionnaire was also designed with such consideration in mind. The questions in each part of the questionnaire had the same format. Part I of the questionnaire requested responders opinions of several statements. These statements were phrased in a generic sense to avoid biasing responders evaluation. Additionally, the questions avoided using words such as "very," "always," and "never."

Although, the format of the questions in the second part of the questionnaire was different from part I, their wording was similar. For each statement (A through G), responders were asked to indicate their opinion of only one of two available alternatives. These questions followed the same guidelines for avoiding bias as in part I.

### **4. External Validity**

External Validity is concerned with the generalizability of the conclusions reached; in effect, asking if the conclusions drawn from research samples can be generalized to the population. Although this research polled the entire research population, not all participants responded to the questionnaire. Furthermore, the research population in this case study can be considered a part of a larger population of similar universities across the country.<sup>15</sup>

To insure this type of validity, data analysis relied on sound and acceptable statistical tests to aid in deriving research conclusions. These conclusions were also based on significance levels that minimized error and maximized the power of each test.

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<sup>15</sup> Generalizing research conclusions to other universities is not statistically valid since the research population is not a random sample of the total population.

## Research Reliability

Once research validity is assured, its reliability must be assessed to evaluate accuracy and consistency. Reliability, while is not judgment based, is more difficult to substantiate than validity. Reliability requires either repeating the same research method over time<sup>16</sup>, or utilizing different methods to the get the same "relative results" at the same time<sup>17</sup>.

Time constraints, and the exploratory nature of this research made it difficult to incorporate the necessary reliability measures. Nevertheless, two surrogate measures were utilized to evaluate the reliability of questionnaire results. First, requesting interview experts to select three variables considered most important and three variables considered least important resulted in two sets of variables. These variables can be contrasted with questionnaire results. The comparison is shown in table 11.

With the exception of two variables, experts' ranking of the most important variables agreed fully with questionnaire results. The difference in the number of variables between interview and questionnaire results may be attributed to two issues. First, the number of variables available to experts was considerably less than those included in the questionnaire. Second, interview experts were requested to select only three variables they considered most important; questionnaire responders did not have this restriction.

Ranking the least important variables by interview experts, however, differed completely

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<sup>16</sup> This type of reliability measure is known as stability reliability. It involves getting the same or similar results for each person or unit consistently over time. The most common assessment form is the test-retest method. The method involves using the same measure at one point in time and re administering the measure at a later point in time. The major difficulty in using this method is making the assumption that what is being measured has indeed remained stable over time.

<sup>17</sup> Also known as equivalence reliability. The most common form is the split-half technique. Surveys, for example, utilize this technique by including a series of questions measuring a single variable. The questions are then randomly divided into two parts (halves). Split-half reliability is shown if the results of each halves of the questions are relatively the same. Other forms of equivalence reliability include: using different observers (interobserver reliability), different measurement techniques, and coders.

**Table 11. Comparison between interview and questionnaire results of variables' relative importance**

<b>Interview Results</b>	<b>Questionnaire Results</b>
<b>Most Important Variables</b>	
<ul style="list-style-type: none"> <li>- Responsiveness</li> <li>- Perceived importance and impact</li> <li>- Flexibility</li> <li>- Availability of adequate funds</li> <li>- Accounting system used</li> </ul>	<ul style="list-style-type: none"> <li>- Responsiveness</li> <li>- Perceived importance and impact</li> <li>- Flexibility</li> <li>- Availability of adequate funds</li> <li>- Accounting system used</li> </ul>
<ul style="list-style-type: none"> <li>- Tying rewards to successful budget preparation and maintenance</li> <li>- Participation</li> </ul>	<ul style="list-style-type: none"> <li>- Giving adequate responsibility and accountability</li> <li>- Response time</li> <li>- Congruency of goals</li> <li>- Management/supervisory style</li> <li>- Education and experience of those responsible for budget maintenance</li> <li>- Education and experience of those responsible for budget preparation</li> </ul>
<b>Least Important Variables</b>	
<ul style="list-style-type: none"> <li>- Type of budget</li> <li>- Education and experience of those responsible for budget maintenance</li> <li>- Education and experience of those responsible for budget preparation</li> <li>- Budget preparation time</li> <li>- Environmental factors</li> <li>- Budget horizon</li> <li>- Costs and benefits associated with using a budget</li> </ul>	<ul style="list-style-type: none"> <li>- Type of budget</li> <li>- Frequency of change</li> <li>- Tying rewards to successful budget preparation and maintenance</li> <li>- Number of individuals and levels involved</li> <li>- Structure and complexity</li> <li>- Budgetary slack</li> <li>- Number of revenue centers in relation to cost centers</li> </ul>

*Shaded area indicate similar responses between questionnaire and interview results*

from questionnaire results. The two phases of the research agreed on only one out of seven variables. Despite this disagreement, questionnaire results may be considered reliable since the objective of this research is to determine the most important variables affecting budgets<sup>18</sup>.

### ***Reliability Coefficient***

The second reliability measure utilized a statistical coefficient as an indicator of questionnaire internal consistency. The Cronbach Alpha coefficient<sup>19</sup> was used to evaluate the consistency of responses by responders. The Alpha coefficient measures the sum of variation of responses within each question relative to the variation of responses in all questions. The greater the ratio the smaller the resulting Alpha, and the less reliable the questionnaire. The Alpha coefficient is also useful in identifying unreliable questions. Not including the responses of a question in the evaluation yields a different coefficient. This new coefficient can be compared to the original Alpha value. If the new coefficient is significantly higher than the coefficient for all questions, the reliability of the question is suspect.

The results from the Cronbach Alpha evaluation for questionnaire responses is shown in Table 12. The computed Alpha for questions 1 through 33 and questions 38, 41, 43 and

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<sup>18</sup>One disturbing finding, however, is the apparent disagreement between interview and questionnaire experts regarding the importance of education, experience, and training of those in charge of preparing and maintaining budgets. Questionnaire experts rated these variables among those critical to budget success, while interview experts thought they were of little importance. The researcher finds this disagreement very difficult to explain, and attributes it to the relatively small number of interview experts.

$$^{19} \text{Cronbach Alpha } (\alpha) = \frac{p}{p-1} \left( 1 - \frac{\sum_i \text{Var}(Y_i)}{\text{Var}(Y_o)} \right)$$

- Where;
- P = Number of questions
  - Var(Yi) = Variance of responses to question i
  - Var(Yo) = Overall variance of all questions

**Table 12. Cronbach Alpha Coefficient for Questionnaire Results**

<b>Cronbach Alpha</b>				
For Raw Variables			: 0.7983	
For Standardized Variables			: 0.8059	
Deleted Variable	Raw Variables		Standardized Variables	
	Correlation With Total	Alpha	Correlation With Total	Alpha
Q1	0.4177	0.7870	0.4320	0.7953
Q2	0.4800	0.7850	0.5132	0.7916
Q3	0.5018	0.7850	0.5180	0.7914
Q4	0.3991	0.7890	0.4144	0.7960
Q5	0.0323	0.8060	0.0397	0.8122
Q6	0.2600	0.7950	0.2343	0.8039
Q7	0.3462	0.7910	0.3208	0.8002
Q8	0.1286	0.8040	0.1252	0.8086
Q9	0.3760	0.7890	0.3676	0.7981
Q10	0.5623	0.7790	0.5786	0.7886
Q11	0.5343	0.7820	0.5374	0.7905
Q12	0.1999	0.7970	0.1860	0.8060
Q13	0.3424	0.7910	0.3314	0.7997
Q14	0.2401	0.7970	0.2368	0.8038
Q15	0.2554	0.7950	0.2456	0.8034
Q16	0.1323	0.7990	0.1369	0.8081
Q17	0.5077	0.7850	0.5293	0.7908
Q18	0.3589	0.7910	0.3608	0.7984
Q19	0.4256	0.7880	0.4427	0.7948
Q30	0.2494	0.7950	0.2593	0.8028
Q31	0.4438	0.7890	0.4390	0.7950
Q32	-0.0609	0.8110	-0.0680	0.8166
Q33	0.3354	0.7920	0.3329	0.7997
Q38	0.2921	0.7930	0.2866	0.8017
Q41	0.5339	0.7810	0.5397	0.7904
Q43	0.0646	0.8010	0.0982	0.8097
Q45	0.4390	0.7870	0.4460	0.7946

*Shaded areas reflect variables having a significantly low correlation with total*



45 was almost 80%. Furthermore, the systematic exclusion of the questions did not show significant difference in the computed coefficients. Therefore, we can conclude the questionnaire is a reliable instrument in assessing responders opinions of efficacy variables.

## **RESEARCH IMPLICATION AND DISCUSSION**

This study represents a new approach to researching budgets. The findings of this research have implications for improving our understanding of what determines the efficacy of budgets as management control systems. By looking at the input side of the budgeting process, we were able to shed light on often neglected variables that may have a great deal more effect on budgets than conventionally thought. This section presents research findings in detail, addresses research limitations, and suggests some useful direction for future research.

According to the results of this research, budget success is, for the most part, dependent on eleven variables. These variables, in order of their perceived importance, are:

1. availability of adequate funds,
2. flexibility,
3. management/supervisory style,
4. response time for unplanned changes,
5. giving adequate responsibility and accountability,
6. congruency of goals,
7. perception of budget importance,
8. ability to respond to changes,
9. education, experience, and training for those in charge of budget maintenance,
10. accounting system used, and
11. education, experience, and training for those in charge of preparing budgets.

The findings of this study have a number of implications. First, knowing in advance which variables are critical to budget success should save organizations valuable time and resources. By paying needed attention to these important variables, management can save otherwise wasted energy on variables that have very little to do with budget success.

Management time is a very scarce resource, and spending that time on fruitless endeavors is what every manager aspires to avoid. Knowledge of what decisions and actions yield the most benefits will not only minimize the time managers spend on solving problems and catering to crises, it will also afford them needed time to improve their operations. Furthermore, since budgets are means used to accomplish organizational long-term and short-term plans, budget success should thus correspond to the success of the organization itself. Giving management the insight into what it takes to enable a budget to succeed will provide them with a benchmark they can use to assess their budgetary practices and determine what changes are needed to insure future successes.

Considering the variables critical to budget success also suggests an important finding. All these variables require a great deal of work on the part of management. None of them could be considered a "quick fix," nor could they be delegated to others in the organization. Only management is capable of inducing sufficient change into these variables. Furthermore, significant change in these variables will not happen overnight. In order to properly incorporate these variables, a continuous and sustained effort is needed. The results of this study support Deming's call for management to accept responsibility of the organizational systems they truly own. Management should understand that their job is not supervision but leadership. The only possible path to improvement is through management acknowledgment of their responsibility and taking a leading role into future change (Deming, 1986).

Budgetary systems are certainly one of those systems management owns. Some argue that the only way to improvement is through participation of employees. While it may be difficult to disagree with such an argument, participation can not be forced upon people, nor is it alone sufficient to provide needed improvement. The current study indicated that participation was not critical to budget success. Instead, it was ranked eighteenth out of thirty-three variables. Employees must want to participate for participation to work. Leaders who are able to inspire employees to new highs, who give them adequate responsibility and accountability, who create congruency of goals and objectives among them, who make them realize their importance and the importance of what they do, and who provide them the training and education they need to effectively do their job, will realize the fruits of their motivation to participate.

## **Effectiveness, Efficiency, or Efficacy**

Perhaps the most important aspect of this study is the examination of budgets in terms of their efficacy instead of the conventional view of effectiveness or efficiency. But what does efficacy really mean? And what is the implication of its consideration on the findings of this study? To fully understand what efficacy is and how it is different from effectiveness or efficiency, it is helpful to view the budgeting cycle in terms of three major parts as depicted in figure 11. The input side of budgeting encompasses all that is required and needed to originate a budget, and includes such aspects as plans, resources (human, physical, and monetary), and constraints. The process phase of budgeting is the mechanistic aspect of maintaining and controlling resource allocations. It is the most time consuming and hence receives greater attention than the other phases. In fact, decision makers are often criticized for pursuing efficiency at the expense of effectiveness (Drucker, 1966 and Stiess 1972). Finally, the output/outcome phase conveys budgeting results and the extent to which plans have been achieved.

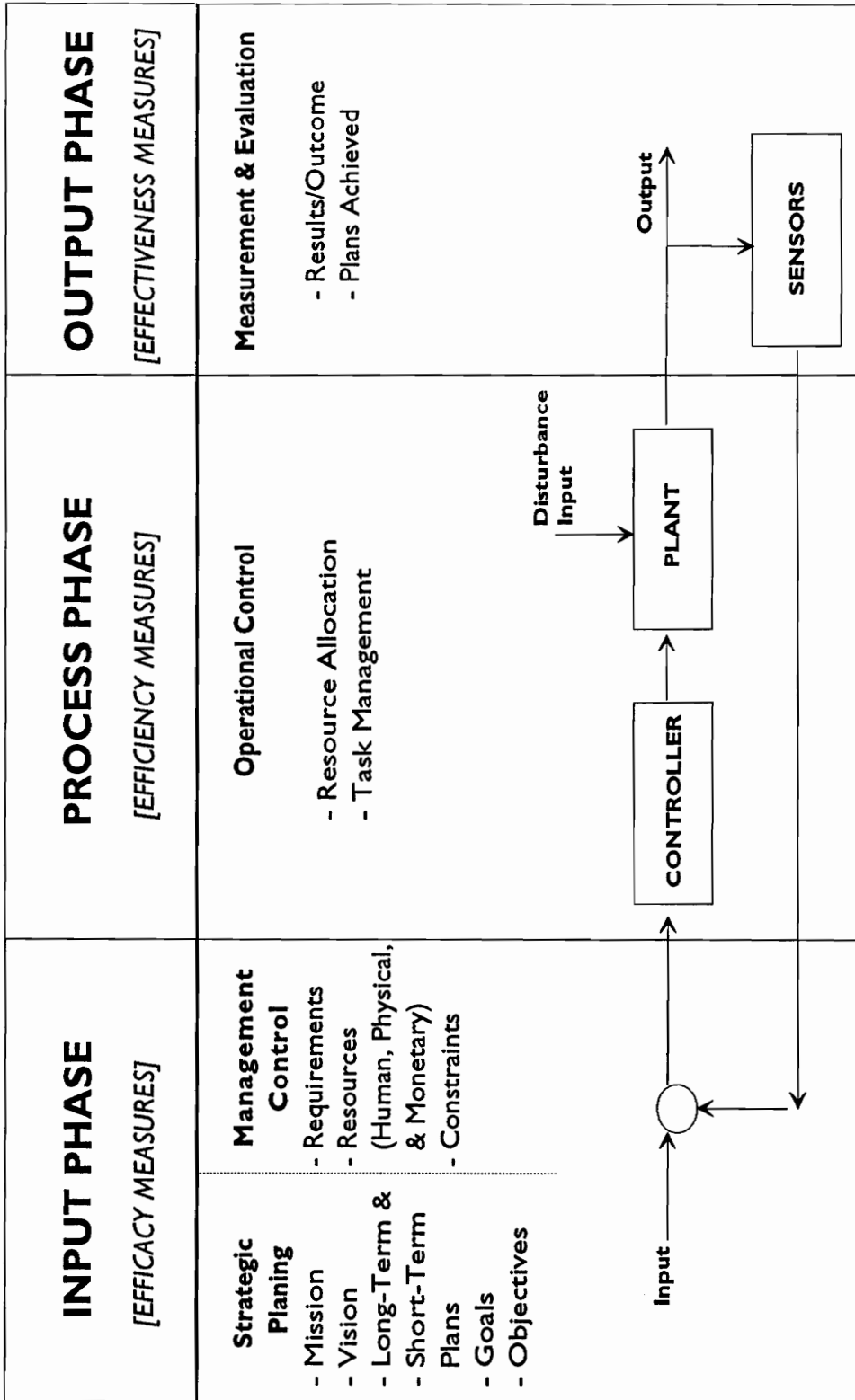
Traditionally, performance of any control system, budgets included, is mainly concerned with 1) effectiveness; the degree to which desired results are achieved and 2) efficiency; the cost-effectiveness of the actions taken to achieve the results. These measures respectively correspond to the output/outcome and the process phases of the budgeting cycle. Consequently, the input side of the budgeting cycle is often left without any attention<sup>1</sup>. This study reflects an attempt to empirically show the need to give due attention to the input side of the budgeting cycle by considering the significance of an equally important measure of budget performance; its efficacy<sup>2</sup>.

According to the New World Dictionary, efficacy is the "power to produce effects or intended results." Within the definition lies the importance of such a measure. Budget

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<sup>1</sup> The difficulty in establishing measures of performance for the input side of the budgeting cycle may account for its lack of attention.

<sup>2</sup> Recently, interest in productivity as a measure of performance has received considerable attention. However, productivity measures suffer the same problems as effectiveness and efficiency. "Measures of productivity are like statistics on accidents: they tell you all about the number of accidents in the home, on the road, and at the work place, but they do not tell you how to reduce the frequency of accidents" (Deming, 1986: 15).



**Figure 11. The Multi-Phase Perspective of Budgeting Cycle and its Relationship to the Control System Model.**

efficacy is the power to attain plans, goals, and objectives. It is an indicator of the degree to which a budget is likely to achieve those plans for which it was designed. Thus, considering budget efficacy translates into examining the "ingredients" necessary for its success, and correspond to the input side of the budgeting cycle. In this view, the success of any budget is as dependent on the adequacy of each input element as it is on the efficiency of their allocation or the resulting effectiveness.

The empirical results presented in this research are a first step toward an understanding of the importance of efficacy consideration for a control system. Table 13 shows the division between research variables according to the phases/parts of the budgeting cycle. It clearly presents an important finding; budget success is determined long before its origination. The majority of the variables on which budget success is dependent are input variables. The suitability and the adequacy of these variables play a very important role in determining the likelihood of success a budget may have.

To further illustrate the importance of budget efficacy, a parallel is proposed between the efficacy of a budget and reliability consideration for engineering product design. Reliability is a measure of durability, and is often indicated in terms of how much or how long a product is used before it breaks down. Product failure could be attributed to poor design, faulty assembly, or improper use. Though attempts are usually made by manufacturers to inspect the product for faulty assembly prior to putting it to use, ultimately product reliability is an outcome measure as the product is used over time. However, product reliability is determined long before any attempts are made to produce it. Product reliability is determined by assessing the quality and fit of components that make up the product. Regardless of how many demands are placed on product performance or how much inspection is done before use, product reliability will remain the same until the quality and fit of the components are reassessed.

The same is true for budget efficacy. Both product durability and budget success are measured after use or implementation. Both reflect attempts to supersede failures by inspection and efficiency measures. But most importantly, the likelihood of success or failure for both will remain relatively the same until input components are re-evaluated.

Table 13. Input/Output Analysis for Budget Efficacy Variables

INPUT	PROCESS	OUTPUT
Responsiveness	Frequency of Review	Tying Rewards to Successful Budget Preparation and Maintenance History of Successful Performance
Response Time	Perception of Importance	
Availability of Adequate Funds	Frequency of Change	
Type and Format of Budget	Flexibility	
	Costs and Benefits Associated with Budget Use	
	Participation	
	Congruency of Goals and Objectives	
	Acceptance of Goals	
Number of Individuals and Levels Involved		
Budget Horizon		
Education, Experience, and Training of Individuals in Charge of Budget Preparation and Maintenance		
Structure and Complexity		
Number of Revenue Centers in Relation to Cost Centers		
Variety of Sources of Funds		
Giving Adequate Responsibility and Accountability		
Management Long-Term and Short-Term Focus		
Budgetary Slack		
Budget Purpose (Planning vs Control)		
Budget Preparation Time		
Accounting System Used		
Management/Supervisory Style		
General Economy		
Nature of Work and Type of Department		

Shaded areas indicate variables belonging to more than one phase of the budgeting cycle

## **Budgets and the Economy**

It is suggested that budgets emphasized when times are bad (Argyris, 1953). As soon as revenues decrease and economic future begins to look bleak, management's attention immediately shifts to budgets. The disturbing fact, however, is the extent of such emphasis. Due to economic hardship, management shifts its attention to increasing efficiency by applying pressure through the budget.

The university under this study has been under similar pressure for the past two years. During that time, it had to endure several rounds of budget cuts imposed by the general assembly of the commonwealth of Virginia. The university officials were requested to trim excess and to "do more with less." Several programs were discontinued and many projects were put-off indefinitely. Consequently, budgets and their corresponding cuts have taken center-stage in the lives of everyone associated with the university.

The results of this study reflected the concerns many share regarding budgets, but not to the extent expected. The variable ranked first among all efficacy variables was "the availability of adequate funds." Such ranking reflect departments' concern of the ever looming future rounds of budget cuts and having to provide the same services with significantly less resources than needed. However, the findings of the current research provided mixed signals about the relationship between budgets and the economy. When asked if budget success is dependent on the general economy, questionnaire respondents indicated that the economy is not critical to budget success. They acknowledged its effect, but did not rank it among the variables considered critical to budget success. Furthermore, variables that might reduce the impact of economic hardship, such as availability of variety of funds and budgetary slack, were also not considered critical to budget success. In fact, budgetary slack was ranked among the variables considered to have the least effect on budget success.

Theoretically, the general economy should not be critical to budget success. Yet the management tendency to emphasize cost-effectiveness over achievement of goals when times are bad is often a key factor in assessing and obtaining budget success. Respondents to this research might have indicated their theoretical beliefs and not the reality of the relationship between budgets and the economy. They also might have been consumed in



their concerns of the continuous cuts forced upon their budgets and not able to see the linkages between them.

### **Limitations of the Results**

The interpretation of the results of this study needs to be tempered by a recognition of research limitations. In addition to the limited scope of the research, there are methodological and procedural issues which must be acknowledged.

It should be noted that due to time and resource constraints, the scope of this research was limited to only Virginia Polytechnic Institute and State University (VPI). Furthermore, the focus of the research was confined at the departmental level of the various colleges within the university. Therefore, the results and conclusions drawn from this research are only relevant to similar departments at universities similar to VPI. Additionally, while the researcher would like to relate the findings to control systems in general, this study only considered budgetary systems.

The research method used in this study has some limitations that should also be acknowledged. First, while the validity of the various components of the research was defended, the suitability of the overall approach --including the sequencing and applicability of the various phases-- was not established. The current research approach relied on group problem solving and idea generation techniques for its design. The approach reflects a hybrid form of combining elements from the Nominal Group Technique (NGT) and the Delphi Technique<sup>3</sup>. However, despite the wide-spread use of both techniques, the current approach is unique in form and, therefore, its applicability and reliability may be suspect. Other approaches might be more appropriate and, hence, may provide more valid and reliable results than the current approach.

Second, the current approach relied extensively on experts' opinions for identifying and ranking efficacy variables. While guidelines were established for the selection of interview

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<sup>3</sup> For details on NGT and Delphi Techniques refer to Delbecq, A., De Ven, V. and Gustafson, D., Group Techniques for Program Planning, Green Briar Press: Middleton, Wisconsin, 1986.

and questionnaire experts, it was not always possible to verify them for questionnaire responders. The position of questionnaire responders was the only available criterion for selecting many of them<sup>4</sup>. Therefore, the researcher recognizes the potential for some invalidity of research results.

A third limitation to the research method is attributed to the researcher's limited knowledge and experience in questionnaire design. In hindsight, the researcher recognizes the potential for responder's confusion to part II of the questionnaire. Despite the efforts made to clarify it, its unusual form could easily confuse responders who did not give it the time and attention required. Moreover, dividing the questionnaire into two parts with two different formats could be potentially confusing to some responders. Responders who routinely fill out questionnaires<sup>5</sup> might not recognize the change in form, and unconsciously provide an improper or a wrong response.

Finally, it should be noted that the procedures used to analyze questionnaire results also limit the degree to which generalizations can be made. The most important of these limitations is due to the size of research population and the corresponding number of responders from that population. Having ninety-two potential responders from which only fifty completed the questionnaire raises concerns regarding sampling errors. As mentioned previously, small populations require a significantly large response rate to attain an acceptable level of accuracy. The resulting response rate -approximately 55%- is relatively small for the research population. Questionnaire design experts require a minimum of seventy percent response rate for such a small population in order to attain an acceptable level of accuracy (Frery, 1991 and Hinkle et al, 1985). This in turn raises important questions regarding the validity of the analysis.

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<sup>4</sup> Obtaining information regarding the qualification and experience of potential responders is a very sensitive matter. Even the best attempts could alienate responders, thus eliminating any future contact with them.

<sup>5</sup> It is often argued that there is a segment of the population who routinely respond to almost all questionnaires they receive. On the other hand, others never, or rarely, respond to the same type of questionnaire. The difference in aptitude among responders is considered a limitation to questionnaires in general. Since the responders to a questionnaire does not include a cross section of potential responders, generalizing research findings should be limited to that segment of the population who are more likely to respond.

These limitations point to the need for refinements and extensions of the present study. Indeed, the researcher foresees more benefits from attempts to refine and extend the present study than efforts to validate the results. The objective of this study was to provide a fresh and new direction of researching management control systems. Only by refining and extending the current study can any definitive results be obtained.

## **Future Research**

The findings of this study, as well as its limitations, suggest some useful directions for future research, which should focus on four major issues. First, there is a need to refine the definitions of the variables investigated in this research. Though many of these variables are generic enough for most people to understand, they offer little help when attempts are made to put them in practical contexts. For example, the findings of this study suggested that incorporating flexibility measures within a budgetary system greatly enhances its likelihood of success. According to Anthony, "*flexibility involves the ability to change a plan without undue cost or friction, an ability to detour, and ability to keep moving toward a goal despite changes in environment, or even failure of plans*" (1965: 151). Most researchers and practitioners would find such a definition very acceptable. Yet, the definition fails miserably when attempts are made to put it to practice. How would one improve the flexibility of a budgetary system? What elements within a budget must be manipulated to enhance its flexibility? What is an acceptable level of flexibility for a given budget and a given organization? Better definitions are needed to answer these questions - and similar ones for other variables - for each of the variables discussed in this research.

Second, more research is needed to explain the direction of the associations between efficacy variables. As discussed earlier, correlation analysis indicated possible associations between variables, however, it was not clear what causal relationships these associations had. Follow-up research should consider the schematic model presented in figure 8, and attempt to explain the causal relationships between the variables. To do so, applied research is needed to examine each association and determine which of the variables has dependency on others. The use of longitudinal research design should improve

researchers' ability to make clear distinction about the cause and effect relationships between variables.

A third important direction suggested here is that the current research should be extended to include a larger subset of the overall population of budget users. Future research should include institutions other than universities in its potential population. Profit and non-profit organizations, Government agencies, small and large establishments and corporations, as well as industrial and service organizations, should be represented in future efforts to discern variables contributing to budget efficacy. It would be unreasonable, however, to expect only one research effort to include such a broad research population. Future research should move into such a desired state by, first, examining other universities to establish acceptable generalizations among them. Other efforts may then be applied to each type of organization to establish similar generalizations applicable to them. Finally, once a thorough understanding is established of budget efficacy for every type of organization, generalization to other types can be validated by including a representative and cross-sectional sample of the entire population in a confirmatory study.

Lastly, future research efforts should examine other management control systems in their studies. Budgets are not the only control systems available to management. Other systems such as management by objectives, cost accounting, and time-event networks (PERT, CPM, Gantt charts) also aid organizations in attaining their plans, goals, and objectives. Examining these systems, as well as other control systems, should provide needed insight into managing them. However, the current body of knowledge seems to fall short of providing an acceptable description of what really constitutes a management control system. Therefore, an immediate and important step should be to establish guidelines for identifying control systems available to management. These guidelines can then be used to generate an exhaustive list of control systems in all types of organizations. Finally, to aid researchers in reaching conclusions applicable to one type of control system and not the others, a framework will be needed to organize these systems according to acceptable criterion and classifications. Such a framework will also aid researchers by providing them a common basis from which organized and synergetic research can emanate.

Exploratory research, such as this, expands the body of knowledge not by providing answers, but by pointing out directions for further research. The questions raised during this research must be addressed to describe the limits of the findings, and to understand the degree to which generalizations can be made.

## CONCLUSION

Performance should be measured by potential, not by output or outcome. Results provide hindsight: it tells what is wrong, but not what caused it, how to correct it, and most importantly how to prevent it from reoccurring. Fire fighting and catering to crises can only lead to more of the same; it does not insure the success of the control system. Ultimately, budget success is measured by the extent to which plans are achieved. However, effectiveness measures are post-facto indicators of the outcome of a sequence of decisions and actions. Relying on such measures alone will not yield desired results regardless of how much pressure is put on the decision maker. Budgetary systems must include efficiency measures to assess the cost-effectiveness of the decisions, and more importantly, efficacy measures to give needed insight into the likelihood of budget success.

The results of this study indicated that budget success is dependent on twenty-seven variables, of which ten variables were considered critical. The majority of these variables corresponded to the input side of the budgeting cycle. This findings underscore the importance of considering input elements in the evaluation the overall performance of control systems such as budgets. Furthermore, the results of this study indicated that budget success is, for the most part, dependent on management and not the employees who have the responsibility of preparing and maintaining budgets. Significant changes in any of the variables critical to budget success require management to acknowledge their responsibility and the importance of their leadership role. Finally, while managers operate under pressures to continually improve efficiency, using budgets to pressure employees will not yield long-term benefits. In the short term, some benefits may be gained, however, increasing efficiency tends to put employees under tension and to create an atmosphere of every one for himself. The resulting coalitions and employees' aggression generates forces which in the long run decreases efficiency. Consequently, no one wins;

management had mortgaged the future to bring about immediate increases in efficiency (Lemke & Edwards, 1961).

Having said all this, the researcher recognizes the potential for invalidity in research findings. The limitations imposed upon this study restricted the degree to which generalizations can be made. Consequently, the findings are only applicable to budgetary systems for academic departments within universities similar to Virginia Polytechnic and State University (VPI&SU).

As with any research, the outcome of this study created more questions than it answered. To be useful, the current research should be extended to other organizations and control systems. The results presented here merely demonstrate the advantages to be gained from such an approach. Future research should address the questions raised during this study to be able to make acceptable generalizations, and to fully realize the science behind the art of managing budgetary and other control systems.

A caveat is in order. In our search to generalize research findings, we may be sacrificing content and usefulness. Findings which are applicable to only one organization and under specific conditions serve little use. At the same time broad statements directed to all organizations lack substance and content to make it of any use. Broad statements make the false assumption that organizations exhibit average characteristics and behaviors. More importantly, such statements assume the conditions within which they were made are stable and are the same for all organizations. Just as there is no such thing as the average person, the average organization or condition does not exist either. Therefore, "the problem is to find generalizations that are valid under certain specified conditions, but at the same time to avoid those that have so many conditions attached to them that they have no generality at all. The proper point is somewhere between the extremes....A useful generalization addresses the question: under what circumstances should we make such a statement." (Anthony, 1965: 160).

## GLOSSARY

**Autonomy.** Refers to the latitude that someone has in making a decision with regard to the sum of the actions that are to be taken within a given situation (Maciariello, 1984; 78).

**Control System.** An arrangement of physical components that promote self-regulation or the regulation of another system (Bucek, 1989).

**Cooperation.** The act of a group to overcome a limitation they could not have done as individuals.

**Correlation.** A term used to indicate the intensity or magnitude of the relationship between one variable and another.

**Delphi Technique.** A method used for the systematic solicitation and collation of judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of opinions derived from earlier responses.

**Effectiveness.** Achieving desired goals.

**Efficacy.** The power to produce effects or intended results.

**Efficiency.** The relationship of the output of an action to the amount of effort/resource it took to achieve it.

**Goals.** The continuing and endless purpose of the organization (Maciariello, 1984; 78).

**Nominal Group Technique.** A problem-solving or idea-generation technique in which individuals are brought together but not allowed to communicate verbally except during specified times.

**Objectives.** Refer to specific, short-term and predominantly quantitative purposes of an organization (Maciariello, 1984; 78).

**Organizational control.** The processes by which organizations govern their activities so that they continue to achieve the objectives they set for themselves



(Emmanuel, Otely, and Merchant, 1990; 11).

**Organizational Order.** The sustained pattern of behavior and beliefs which characterize an organization and molds its accomplishments (Dermer, 1988; 25).

**Organizational Structure.** The formal definition of the lines of responsibility and authority and communication channels among various levels of the hierarchy of management (Maciariello, 1984; 78).

**Organizations.** Social units devoted primarily to the attainment of specific goals (Etzioni, 1965).

**Paradigms.** Coherent and consistent laws, theories, applications, and methodologies that enjoy general acceptance in the scientific community.

**Personal Control.** An individual's beliefs, at a given point in time, in his or her ability to affect a change, in a desired direction, on the environment (Greenburger et al, 1989).

**Product Reliability.** The probability that a product will perform in a satisfactory manner for a given period of time when used under

specified operating condition (Blanchard & Fabrycky, 1990).

**Productivity.** A measure of performance assessed in terms of the ratio of the resulting output over required input for an operation, process, or system.

**Reliability.** The ability to repeat the same actions or results under the specified condition over time.

**Research (Confirmatory).** A type of research designed to determine if earlier findings hold under similar or different conditions.

**Research (Exploratory).** A study designed to explore a phenomenon, attempt to explain relationships between variables or constructs, or develop a hypothesis.

**Research (Longitudinal).** A study designed to measure a parameter of interest at preset intervals during a specified period of time.

**Validity.** It has to do with truth, strength and value, and like integrity, character, or quality it is assessed relative to purpose and circumstances (Brinberg & McGrath, 1985).

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## **APPENDIX 1**

### **VPI Budgeting Process**

## **Appendix 1 VPI Budgeting Process**

### **Introduction**

The Budgeting process at Virginia Tech supports the notion that budgeting is a planning tool as well as a control tool. While there does not seem to be a fine transition between planning and control, the process clearly illustrates the multiple functionality of budgets.

What makes a budget such a versatile tool, however, poses the difficulty in trying to describe its process. The lack of a "fine transition" between the functions of controlling and planning, in addition to the cyclical nature of the budgeting process (planning-controlling-planning cycle) makes it difficult to identify a starting point. However, adopting Anthony's "Planning and Control" framework<sup>1</sup> provides an appropriate starting point and guidelines for describing the budgeting process.

### **The Phases of the Budgeting Process**

The Budgeting process at Virginia Tech can be divided into three main phases. These phases include 1) Strategic planning, 2) Management control, and 3) Operational control. The following paragraphs will describe each of these phases in detail.

#### ***Strategic Planning***

Strategic planning refers to the formulation of long-range goals and objectives that will impact the direction and makeup of an organization. At Virginia Tech this is done through an elaborate process involving all levels of the university; down to the departmental level. The process begins by requesting each department in the university to

---

<sup>1</sup> In his framework, Anthony classified planning and control systems into three main processes:

1. Strategic planning. Deciding on objectives, changes in these objectives, resources used to attain these objectives, and policies governing the acquisition, use, and disposition of these resources.
2. Management control. Assuring resources are obtained and used effectively and efficiently in the accomplishment of objectives.
3. Operational Control. Assuring that specific tasks are carried out effectively and efficiently.

prepare an eight-year plan, detailing the number of faculty and staff positions, graduate student funding, equipment maintenance, and operations costs. These plans are then sent to their respective colleges where they are summarized into a college strategic plan. The colleges then submit their plans to the senior vice president and provost. Working closely with the budget office, and taking inputs from the executive vice president and chief business officer, the senior vice president prepares a Biennium budget. This budget (plan) is finally submitted to the General Assembly of the Commonwealth of Virginia. Figure 1-1. graphically depicts the strategic planning process.

### ***Management Control***

The effective and efficient allocations of resources to accomplish the organizations objectives is what Anthony refers to as management control. At Virginia Tech, this phase is commonly described as the "Budgeting phase." Once again, this phase involves all levels of the university, however, the direction of the process is exactly the reverse as the strategic planning phase. Figure 1-2. depicts this process.

The process begins when the General Assembly of the Commonwealth of Virginia allocates an annual budget for the university. This budget determines line-item appropriations for the three missions of the university; instruction, research, and extension. This budget becomes the responsibility of the senior vice president and provost, who in turn work closely with the university's budget office to break down the university's budget into sub-budgets for each of the colleges. The colleges will further break down their budgets into departmental budgets, taking into account the requirements of each of the departments.



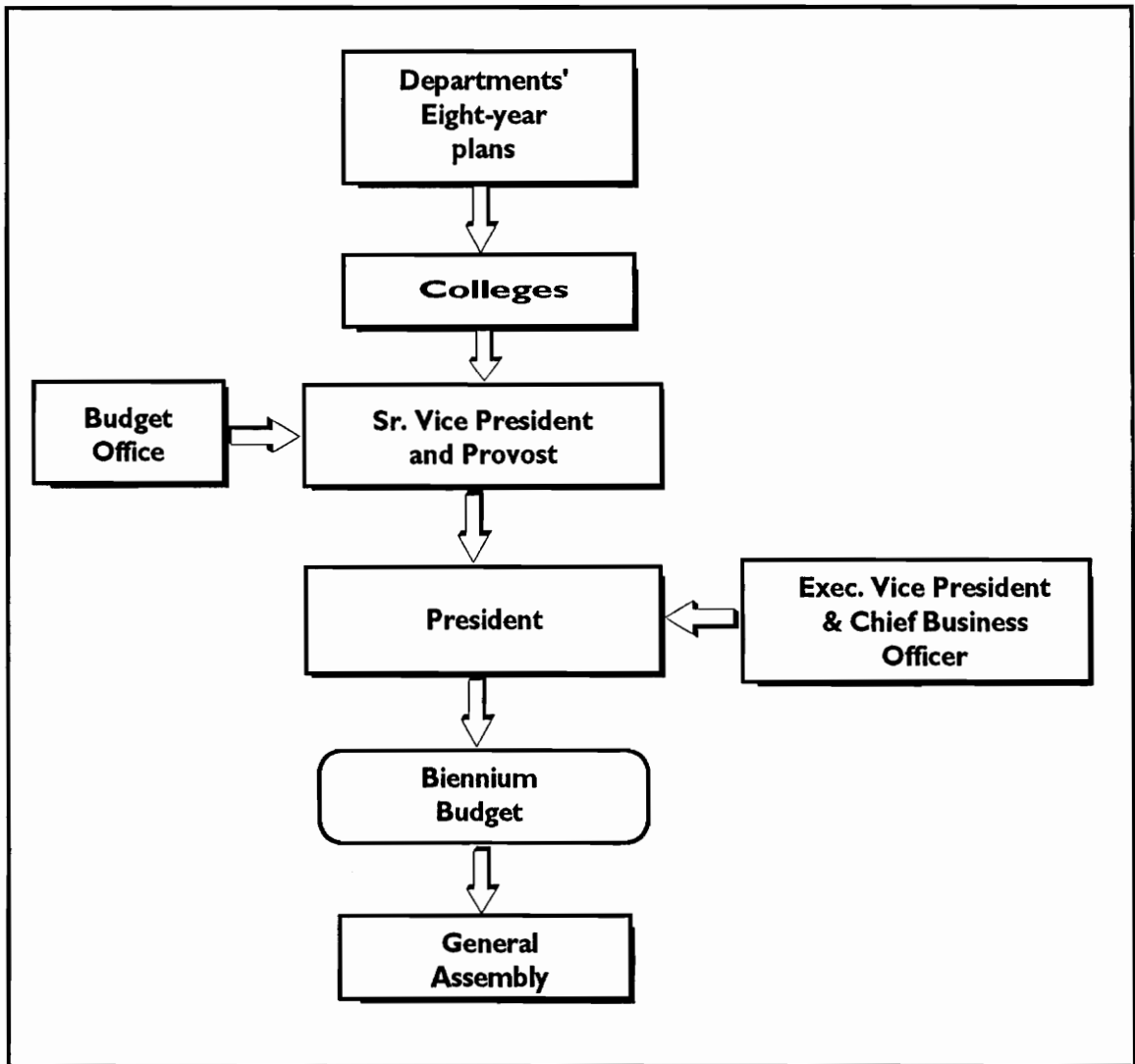


Figure 1-1. VPI Strategic Planning Process

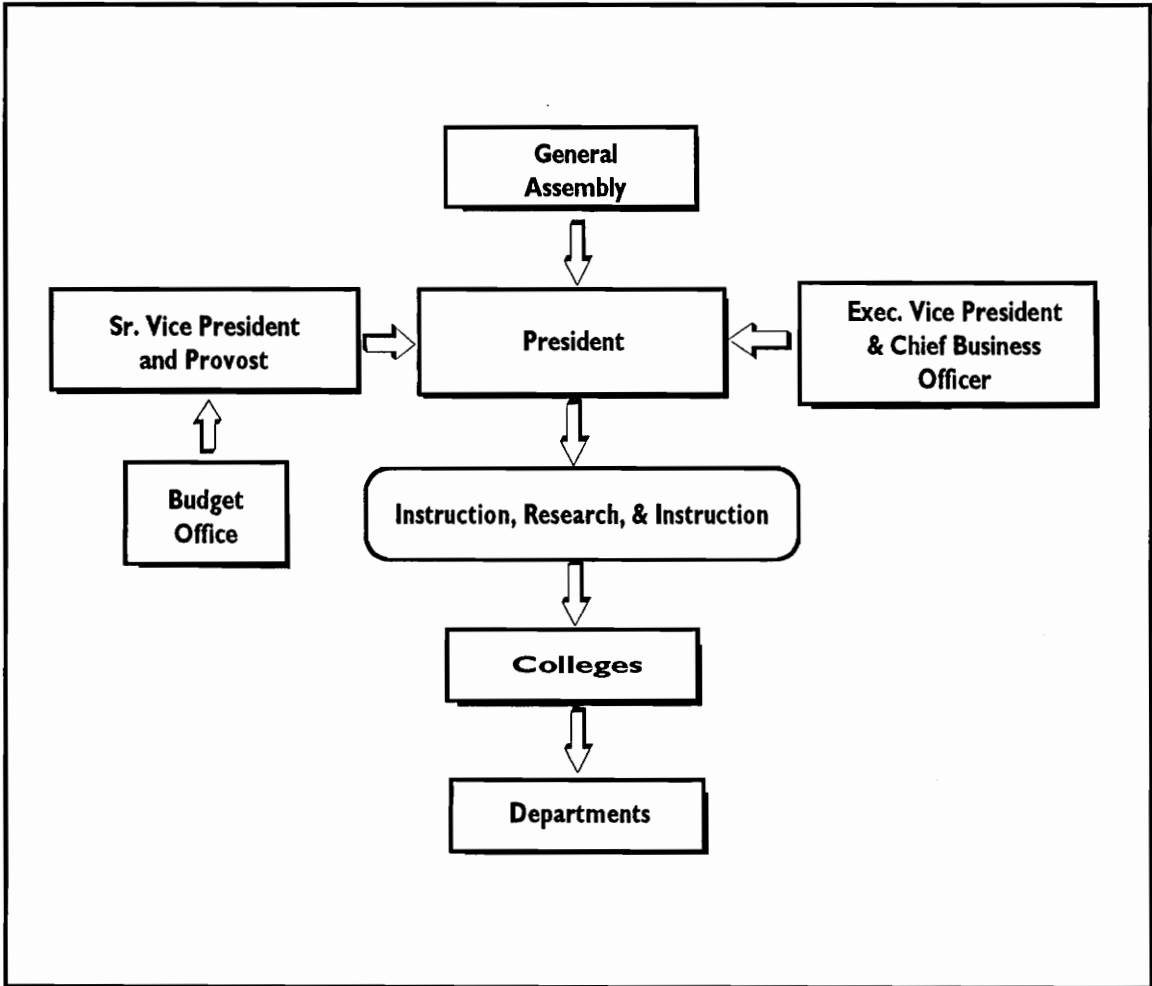


Figure 1-2. VPI Budgeting Process

### ***Operational Control***

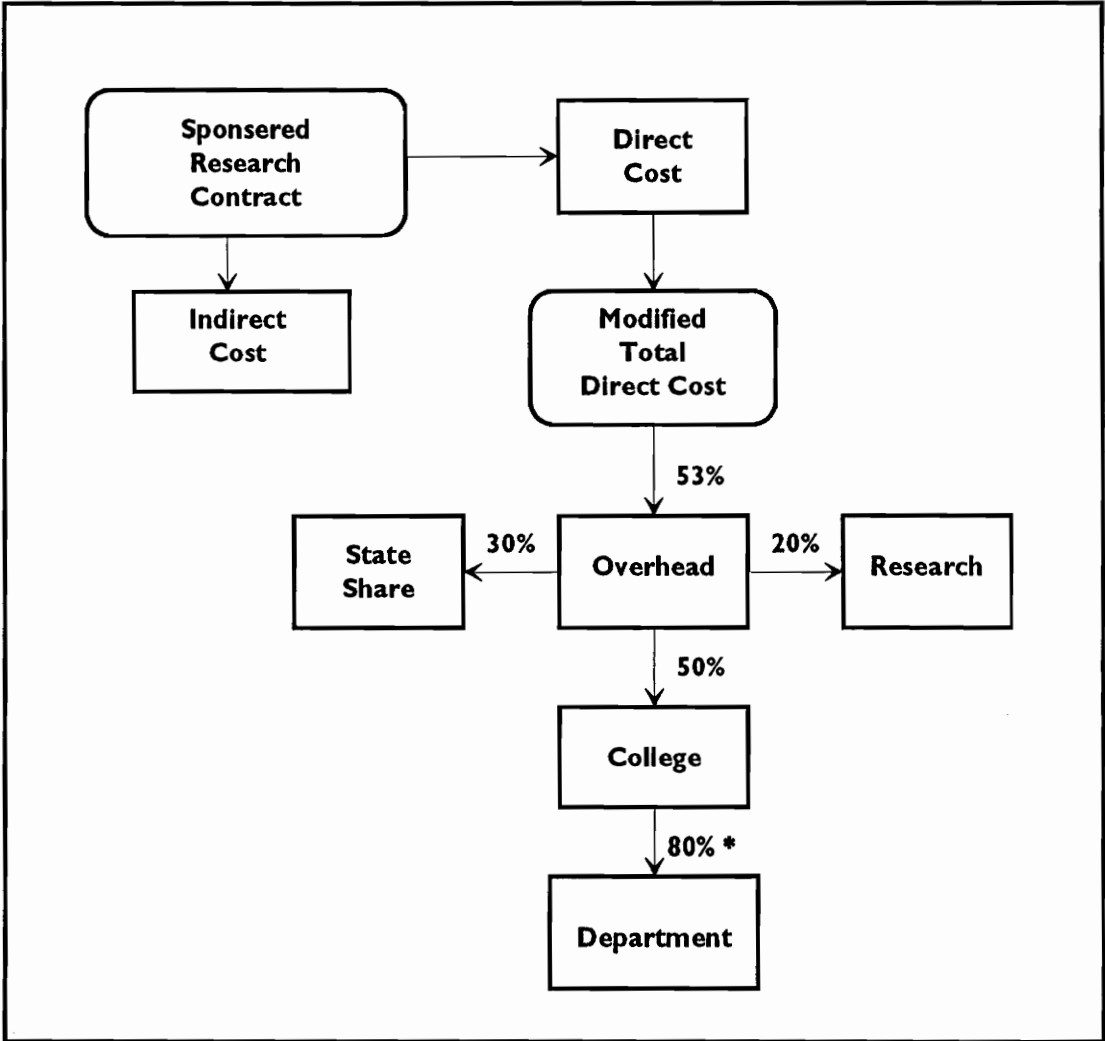
During this phase, budgets turn into control tools instead of planning tools; the actual control of how resources are used in the most effective and efficient way is done in this phase. Virginia Tech's operational control occurs at every level. Each level of the university is responsible for monitoring and controlling their expenditures as compared to their budget. However, the locus of control lies within the university's budget office and at the State-department in Richmond. The budget office is responsible for monitoring the expenditures of all levels of the university, and comparing them against plans. On the other hand, the state department is the only one authorized to pay university costs. Once the allocated budget is reached for any of the line-item appropriations, the state department stops authorizing payments for any costs incurred. It is, therefore, very important for each level of the university to keep track of their costs to avoid such a situation.

### **Sources of Income**

The University has three sources of income:

1. State appropriation through the General Assembly. The annual budget determines how much Virginia will appropriate for the university during any fiscal year. This source accounts for the major part of the university's income.
2. Sponsored research projects. Research contracts provide a venue for the university to increase its income. Contracts to conduct research with government agencies, corporations, and research organizations, such as the National Science Foundation (NSF) contribute greatly to the universities income. All levels within the university are encouraged to seek such contracts since a portion of the income generated is funneled back to the department, college, or any other level in the university that first obtained the contract. The remaining amount is distributed between the university and the state. The distribution of contract income is shown in Figure 1-3.

3. Gifts. This source includes donations and gifts by alumni and corporations. Virginia Tech Foundation, Incorporated, is the body within the university in charge of administrating related expenses and receiving these gifts.



**Figure 1-3. Overhead Calculations for Sponsored Research (as of September, 1992)**

\* The percentage allocated to departments differ according to colleges

**APPENDIX 2**  
**Statistical Testing procedures**

**A. Signed Rank Testing**

**B. 1-Group Z Test**

**C. One Way ANOVA**

**D. Tukey's Multiple Range Test**

## Appendix 2

### Statistical Testing Procedure

#### A. Signed Rank test

- Let  $Y_i = X_i - \mu_o$  (for each observation)
- Compute  $W_i = |Y_i|$
- Rank order (from smallest to largest) the  $W_i$ . Let  

$$R(W_i) = \text{Rank of } W_i$$
- Compute Sum of the Ranks  

$$T^+ = \text{Sum } (R(W_i)) \quad \text{for all } Y_i > 0$$

- For  $H_1: \mu > \mu_o$  : Reject  $H_o$  if  $T^+ > [\{n(n+1)/2\} - A_{n,\alpha}]$   
 For  $H_1: \mu < \mu_o$  : Reject  $H_o$  if  $T^+ < A_{n,\alpha}]$   
 For  $H_1: \mu \neq \mu_o$  : Reject  $H_o$  if  $T^+ > [\{n(n+1)/2\} - A_{n,\alpha}]$   
 or if  $T^+ < A_{n,\alpha}]$

- Where
- $Y_i(s)$  individual observations
  - $\mu_o$  the mean value we wish to test for
  - $A_{n,\alpha}$  pre-calculated value for the test
  - $n$  sample size
  - $\alpha$  probability that  $H_o$  is true

#### B. 1-group Z test

- Let  $Y_i = X_i - \mu_o$  (for each observation)
- Compute  $W_i = |Y_i|$
- Rank order (from smallest to largest) the  $W_i$ . Let  

$$R(W_i) = \text{Rank of } W_i$$
- Compute the expected value of the sum of ranks  $\mu(T^*)$   

$$\mu(T^*) = n(n+1)/4 \quad (n = \text{number of responders})$$
- Compute the variance of the sum of ranks  $\sigma^2(T^*)$   

$$\sigma^2(T^*) = n(n+1)(2n+1)/24$$

-  $T^*$  approaches normality when  $n$  approaches infinity.

- Compute  $Z_{obs.} = [T^* - \mu(T^*)] / [\sqrt{\sigma^2(T^*)}]$

- At a given level of confidence ( $\alpha$ ) reject  $H_0$  if

$$Z_{obs.} > Z_{(1-\alpha)}$$

### C. One-Way ANOVA

- Compute Total Sum of Squares (TSS)

$$TSS = \sum \sum (Y_{ij} - Y)^2$$

- Compute Sum of Squares Within each variable (SSW)

$$SSW = \sum \sum (Y_{ij} - Y_i)^2$$

- Compute Mean Square Within (MSW)

$$MSW = SSW / (N - t)$$

- Compute Sum of Squares Between (SSB) the variables

$$SSB = \sum n_i (Y_i - Y)^2 = TSS - SSW$$

- Compute Mean Square Between (MSB)

$$MSB = SSB / (t - 1)$$

- Compute  $F_{obs} = MSB / MSW$

- Reject  $H_0$  if  $F_{obs.} > F_{(t-1, N-t), 1-\alpha}$

Where;

$N$  overall number of observations

$Y$  overall average for all observations

$Y_i$  average observation for variable  $i$

$Y_{ij}$  observation for variable  $i$  and responder  $j$

$t$  number of variables

$n_i$  number of responders for Variable  $i$



### **D. Duncan Multiple Range Test**

- We wish to test  $H_0: \mu_i = \mu_j$
- Rank order the means of each variable
- for each pair compute  $|Y_i - Y_j|$
- Compute  $W_r = q_{\alpha}(r, v) * \sqrt{MSW / n}$ .
- Reject  $H_0$  if  $|Y_i - Y_j| > W_r$

Where;

$Y_i$  and  $Y_j$  are the mean values of the variables we wish to test for equality.

$q_{\alpha}(r, v)$  is a pre-calculated value for  
r; number of steps between means we are comparing  
v; degrees of freedom for  $MSW = N - t$

## **APPENDIX 3**

### **SAS SOURCE CODE**

#### **A. General Statistics and Correlation Analysis**

#### **B. ANOVA Analysis and Tukey' Multiple Range Tests**

### Appendix 3A. General Statistics and Correlation Analysis

The following SAS code performs nine functions

1. Define title for all printed output.
2. Read questionnaire data form a 37 columns by 50 rows data file.
3. Define input variables.
4. Define the format for printed output.
5. Provide a print out of the data set.
6. Modify the data set to compensate for Optical Mark Reader (OMR) treatment of questionnaire data (add 1 to each data point in the data set).
7. Calculate means and standard deviations for the responses of each question
8. Calculate the frequency of the responses between A and B for questions 34 through 47.
9. Calculate the correlation between questions and the Cronbach Alpha for the questionnaire.

---

```
OPTIONS LS=120 NUMBER MISSING = ' ';
```

```
* PART1;
```

```
* DEFINE TITLE FOR ALL PRINTED OUTPUT;
```

```
TITLE1 'MAHER_S THESIS';
```

```
TITLE3 'BUDGET ASSESSMENT QUESTIONNAIRE';
```

```
* PART2;
```

```
* INFILE DATAFILE "ORIGINAL DATA A";
```

```
* CREATE A PERMANENT SAS DATAFILE "ORIGINAL.DATA";
```

```
*AND SPECIFY THE ROWNUMBERS FOR THE FIRST AND LAST OBSERVATION;
```

```
CMS FI RAW DISK ORIGINAL DATA A;
```

```
DATA ORIGINAL.DATA;
```

```
INFILE RAW FIRSTOBS=5 OBS=55;
```

```
* PART 3;
```

```
* DEFINE INPUT VARIABLES FROM ORGINAL DATA A;
```

```
INPUT RESPON Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15  
          Q16 Q17 Q18 Q19 Q30 Q31 Q32 Q33 Q34
```

Q35 Q36 Q37 Q38 Q39 Q40 Q41 Q42 Q43 Q44 Q45 Q46 Q47 Q48;

*\* PART 4;*  
*\* DEFINE THE OUTPUT FORMAT OF THE RESPONSE SCALE FOR THE VARIABLES;*

```
PROC FORMAT;  
VALUE $RATFMT '1' = 'NEVER'  
              '2' = 'IN SOME CASES'  
              '3' = 'IT DEPENDS (NEUTRAL)'  
              '4' = 'IN MOST CASES'  
              '5' = 'ALWAYS'  
              '6' = 'NOT APPLICABLE';
```

*\* PART 5;*  
*\* PRINT THE DATA SET;*  
*\* TO MAKE SURE EVERYTHING IS FILED IN CORRECTLY;*

```
PROC PRINT DATA=ORIGINAL.DATA;  
TITLES 'ORIGINAL CODED DATA SET';
```

*\* PART 6;*

*\* CREATE A PERMANENT SAS DATAFILE "ANALYS\_1.DATA" FOR LATER MANIPULATION OF THE DATA. THE FOLLOWING CODE WILL ALSO ADD ! TO EACH DATA POINT TO COMPENSATE FOR THE WAY OPTICAL MARK READERS READ THE DATA FROM THE QUESTIONNAIRE;*

```
DATA ANALYS_1.DATA;  
SET ORIGINAL.DATA;  
Q1 = Q1 + 1;  
Q2 = Q2 + 1;  
Q3 = Q3 + 1;  
Q4 = Q4 + 1;  
Q5 = Q5 + 1;  
Q6 = Q6 + 1;  
Q7 = Q7 + 1;  
Q8 = Q8 + 1;  
Q9 = Q9 + 1;  
Q10 = Q10 + 1;
```

```
Q11 = Q11 + 1;
Q12 = Q12 + 1;
Q13 = Q13 + 1;
Q14 = Q14 + 1;
Q15 = Q15 + 1;
Q16 = Q16 + 1;
Q17 = Q17 + 1;
Q18 = Q18 + 1;
Q19 = Q19 + 1;
Q30 = Q30 + 1;
Q31 = Q31 + 1;
Q32 = Q32 + 1;
Q33 = Q33 + 1;
Q34 = Q34 + 1;
Q35 = Q35 + 1;
Q36 = Q36 + 1;
Q37 = Q37 + 1;
Q38 = Q38 + 1;
Q39 = Q39 + 1;
Q40 = Q40 + 1;
Q41 = Q41 + 1;
Q42 = Q42 + 1;
Q43 = Q43 + 1;
Q44 = Q44 + 1;
Q45 = Q45 + 1;
Q46 = Q46 + 1;
Q47 = Q47 + 1;
Q48 = Q48 + 1;
```

*\* CHECK THE DATA SET FOR RESPONSES EQUAL TO SIX, AND CHANGE IT TO ZERO. A NOT APPLICABLE RESPONSE (6) IS TREATED AS A NO RESPONSE IN THE FOLLOWING ANALYSIS;*

```
IF Q1 = 6 THEN Q1 = '0';
IF Q2 = 6 THEN Q2 = '0';
IF Q3 = 6 THEN Q3 = '0';
IF Q4 = 6 THEN Q4 = '0';
IF Q5 = 6 THEN Q5 = '0';
IF Q6 = 6 THEN Q6 = '0';
IF Q7 = 6 THEN Q7 = '0';
IF Q8 = 6 THEN Q8 = '0';
IF Q9 = 6 THEN Q9 = '0';
IF Q10 = 6 THEN Q10 = '0';
```

```

IF Q11 = 6 THEN Q11 = '0';
IF Q12 = 6 THEN Q12 = '0';
IF Q13 = 6 THEN Q13 = '0';
IF Q14 = 6 THEN Q14 = '0';
IF Q15 = 6 THEN Q15 = '0';
IF Q16 = 6 THEN Q16 = '0';
IF Q17 = 6 THEN Q17 = '0';
IF Q18 = 6 THEN Q18 = '0';
IF Q19 = 6 THEN Q19 = '0';
IF Q30 = 6 THEN Q30 = '0';
IF Q31 = 6 THEN Q31 = '0';
IF Q32 = 6 THEN Q32 = '0';
IF Q33 = 6 THEN Q33 = '0';
IF Q34 = 6 THEN Q34 = '0';
IF Q35 = 6 THEN Q35 = '0';
IF Q36 = 6 THEN Q36 = '0';
IF Q37 = 6 THEN Q37 = '0';
IF Q38 = 6 THEN Q38 = '0';
IF Q39 = 6 THEN Q39 = '0';
IF Q40 = 6 THEN Q40 = '0';
IF Q41 = 6 THEN Q41 = '0';
IF Q42 = 6 THEN Q42 = '0';
IF Q43 = 6 THEN Q43 = '0';
IF Q44 = 6 THEN Q44 = '0';
IF Q45 = 6 THEN Q45 = '0';
IF Q46 = 6 THEN Q46 = '0';
IF Q47 = 6 THEN Q47 = '0';
IF Q48 = 6 THEN Q48 = '0';

```

*\* PART 7;*

*\* CALCULATE THE MEANS AND STANDARD DEVIATIONS FOR EACH QUESTION;*

```

PROC MEANS DATA=ANALYS_1.DATA MAXDEC = 4 N MEAN VAR;
TITLE5 'NUMBER OF OBSERVATIONS, MEANS AND VARIANCES FOR ALL
VARIABLES';

```

*\* PART 8;*

*\* COUNT THE FREQUENCY OF REPOSENSE BETWEEN OPTIONS A AND B FOR QUESTION 34 TO 48;*

```

DATA ANALYS_2.DATA;

```

```
SET ANALYS_1.DATA (KEEP = Q34 Q35 Q36 Q37 Q38 Q39 Q40
                  Q41 Q42 Q43 Q44 Q45 Q46 Q47);
```

```
IF Q34 = '' THEN A = '35'; ELSE A = '34';
IF Q36 = '' THEN B = '37'; ELSE B = '36';
IF Q38 = '' THEN C = '39'; ELSE C = '38';
IF Q40 = '' THEN D = '41'; ELSE D = '40';
IF Q42 = '' THEN E = '43'; ELSE E = '42';
IF Q44 = '' THEN F = '45'; ELSE F = '44';
IF Q46 = '' THEN G = '47'; ELSE G = '46';
```

```
PROC FREQ DATA=ANALYS_2.DATA;
TABLES A B C D E F G;
TITLE5 'FREQUENCY OF ANSWERS FOR VARIABLES WITH OPTIONAS A & B';
```

*\* PART 8;*

*\* CALCULATE THE CORRELATION BETWEEN THE QUESTIONS AND THE  
CRONBACHS ALPHA FOR THE QUESTIONNAIRE;*

```
PROC CORR DATA=ANALYS_1.DATA ALPHA;
VAR  Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15
     Q16 Q17 Q18 Q19 Q30 Q31 Q32 Q33
     Q38 Q41 Q43 Q45;
TITLE5 'CRONBACH ALPHA FOR THE BUDGET ASSESSMENT  
QUESTIONNAIRE';
```

## Appendix 3B. ANOVA Analysis and Tukey' Multiple Range Test

The following SAS code performs 5 functions.

1. Define title for all printed output.
2. Read questionnaire data form a 2 columns by 1290 rows data file.
3. Define input variables.
4. Calculate the mean for all questions.
5. Perform ANOVA analysis as well as Tukey' Multiple Range Test.

---

```
OPTIONS LS=120 NUMBER MISSING = ' ';
```

```
* PART1;
```

```
* DEFINE TITLE FOR ALL PRINTED OUTPUT;
```

```
TITLE1 'MAHER_S THESIS';
```

```
TITLE3 'BUDGET ASSESSMENT QUESTIONNAIRE';
```

```
* PART2;
```

```
* INFILE DATAFILE "DATA5 DATA A1";
```

```
* CREATE A PERMANENT SAS DATAFILE "ORIGINAL.DATA";
```

```
* ALSO SPECIFY THE ROW NUMBER FOR FIRST AND LAST OBSERVATIONS;
```

```
CMS FI RAW DISK DATA5 DATA A;
```

```
DATA DATA5.DATA;
```

```
INFILE RAW FIRSTOBS=6 OBS=1295;
```

```
* PART 3;
```

```
* DEFINE INPUT VARIABLES FROM ORGINAL DATA A;
```

```
INPUT QUESTION RESPONS;
```

```
* PART 4;
```

```
* CALCULATE THE MEANS FOR ALL VARIABLES;
```

```
PROC MEANS DATA=DATA5.DATA MAXDEC = 4 N MEAN VAR;
```



```
TITLE5 'NUMBER OF OBSERVATIONS, MEANS AND VARIANCES FOR ALL  
VARIABLES';
```

```
* PART 5;
```

```
* ANOVA ANALYSIS AS WELL AS TUKEY & DUNCAN TESTS;
```

```
PROC ANOVA DATA=DATA5.DATA;
```

```
CALSS QUESTION;
```

```
MODEL RESPNS = QUESTION;
```

```
MEANS QUESTION / TUKEY DUNCAN;
```

```
TITLE5 'ANOVA ANALYSIS';
```

## **APPENDIX 4**

- A. List of Potential Responders**
- B. Cover Letter for First Mailing**
- C. Cover Letter for Second Mailing**

**Appendix 4A. List of Potential Responders**

<b>Colleges</b>	<b>Departments</b>	<b>Responder</b>	<b>Address</b>
1. Agriculture and Life Sciences	Agricultural Economics	Department Head	200 Seitz Hall Telephone: 231-6615
	Agricultural Engineering	Department Head	208-B Hutcheson Telephone: 231-6301
	Crop & Soil Environmental Science	Department Head	330 Smyth Telephone: 231-6305
	Anaerobic Microbiology	Department Head	Anaerobe Laboratory Telephone: 231-6933
	Animal Science	Department Head	3460 Litton Reaves Hall Telephone: 231-6311
	Biochemistry and Nutrition Sciences	Department Head	111 Engel Hall Telephone: 231-6315
	Dairy Science	Department Head	2470 Litton Reaves Hall Telephone: 231-6331
	Entomology	Department Head	216 Price Telephone: 231-6341
	Fisheries and Wildlife Sciences	Department Head	324 Cheatham Telephone: 231-5573
	Food Science and Technology	Department Head	22 Food Science Bldg. Telephone: 231-6805
	Forestry	Acting Head	324 Cheatham Hall Telephone: 231-5482
	Wood Science and Forest Products	Department Head	210 Cheatham Telephone: 231-5330
	Horticulture	Department Head	301 Saunders Telephone: 231-5451
	Plant Pathology, Physiology, and weed Science	Department Head	413 Price Telephone: 231-6361
	Poultry Science	Department Head	2270 Litton Reaves Hall Telephone: 231-9177
2. Architecture and Urban Studies	Building Construction/ Architectur	Chairman	117 Burruss Telephone: 231-5017
	Environmental Design and planning	Department Head	201 Architecture Annex Telephone: 231-7508
	Landscape Architecture	Chairman	202 Architecture Annex Telephone: 231-5506

<b>Colleges</b>	<b>Departments</b>	<b>Responder</b>	<b>Address</b>
2. Architecture and Urban Studies	Urban Affairs and Planning	Department Head	201h Architecture Telephone: 231-5517
3. Arts and Sciences	Art	Department Head Admin Assistant	Old Blacksburg Armory Telephone: 231-5547
	Biology	Department Head  Asst. Head  Assoc. Head	2123 Derring Telephone: 231-5712
	Chemistry	Department Head  Assoc. Head  Dept. Manager	107 Davidson Telephones: 231-8210 231-5997 231-5970
	Computer Science	Dept. Head  Asst. Head	562 McBryde Telephones: 231-6931 231-5232-
	Economics	Dept. Head  Assoc. Head	3016 Pamplin Telephone: 231-5688 231-7697
	English	Dept. Head  Asst. Head	204 Williams Hall Telephones: 231-6501 231-5932
	Foreign Languages	Dept. Head	119 Femoyer Telephone: 231-5362
	Geography	Dept. Head	301 Patton Telephone: 231-6886
3. Arts and Sciences	Geological Sciences	Chairman  Asst. Chairman	4044 Derring Telephone: 231-5222 231-6589
	History	Dept. Head  Assoc. Head	560 McBryde Telephone: 231-8361 231-8362
	Mathematics	Dept. Head	460 McBryde Telephone: 231-6536

<b>Colleges</b>	<b>Departments</b>	<b>Responder</b>	<b>Address</b>
3. Arts & Sciences	Music	Dept. Head	256 Lane Hall Telephone: 231-5685
	Philosophy	Acting Head	309 Patton Telephone: 231-4565
	Physics	Dept. Head Assoc. Head Admin Assistant	123 Robenson Telephones: 231-6544 231-5243 231-8728
	Political Sciences	Acting Head	662 McBryde Telephone: 231-6572
	Psychology	Department Head	5088 Derring Telephone: 231-6581
	Religion	Department Head	310 Patton Telephone: 231-5118
	ROTC, AIR FORCE	Department Head	228 Military Telephone: 231-6404
	ROTC, ARMY	Department Head	226 Military Telephone: 231-6401
	ROTC, NAVY	Department Head	419 Femoyer Telephone: 231-7883
	Science and Technology	Department Head	Price House Telephone: 231- 6760
	Sociology	Department Head	660 McBryde Telephone: 231-6878
	Statistics	Department Head Admin. Officer	406-A Hutcheson Telephones: 231-5657 231-5658
	Theater Arts	Dept. Head	203 Performing Arts Telephone: 231-5335
4. Business	Accounting	Department Head	3007 Pamplin Telephone: 231-6591
	Finance, Insurance and Business Law	Dept. Head	1016 Pamplin Telephone: 231-8647
	Management	Dept. Head	2007 Pamplin Telephone: 231-6353
	Marketing	Dept. Head	2016 Pamplin Telephone: 231-6949
	Management Science	Dept. Head	1007 Pamplin Telephone: 231-6596

<b>Colleges</b>	<b>Departments</b>	<b>Responder</b>	<b>Address</b>
5. Education	Administrative and Educational Services	Director	250 UCOB Telephones: 231-5642 231-9724
		Fiscal Asst.	
	Curriculum and Instruction	Chairman	300 War Memorial Hall Telephones: 231-5347 231-5348
		Fiscal Asst.	
	Health and Physical Education	Division Dir.	115 War Memorial Hal Telephone: 231-8285
	Vocational and Technical Education	Division Dir.	111 Lane Hall Telephone: 231-6384
6. Engineering	Areospace and Ocean Eng	Dept. Head	215 Randolph Telephones: 231-6611 231-5169
		Assoc. Head	
	Chemical Eng.	Dept. Head	133 Randolph Telephone: 231-6631
	Civil Eng.	Dept. Head	200 Patton Telephones: 231-6635 231-9051
		Asst. Head	
	Electrical Eng.	Dept. Head	340 Whittemore Telephones: 231-6646 231-6647
		Asst. Head	
		Admin Assistant	
		Engineering Fundamentals	Dept. Head
	Eng. Science and Mechanics	Dept. Head	225 Norris Telephones: 213-3243 231-5726 231-3243
		Asst. Head	
		Adm. Assistant	
	Industrial and Systems Eng.	Dept. Head	302 Whittemore Telephone: 231-6656
	Materials Engineering	Dept. Head	213 Holden Hall Telephone: 231-6640

<b>Colleges</b>	<b>Departments</b>	<b>Responder</b>	<b>Address</b>
6. Engineering	Mechanical Eng.	Dept. Head Asst. Head	114-OPP Randolph Telephones: 231-6661 231-7462
	Mining and Minerals Eng	Dept. Head	100 Holden Telephone: 231-6671
7. Human Resources	Clothing and Textiles	Dept. Head	103 Wallace Telephone: 231-6179
	Family and Child Development	Dept. Head	102 Wallace Annex Telephone: 231-4794
	Hotel, Resturant, and Institutional Management	Dept. Head Asst. Head	18 Hillcrest Hall Telephones: 231-5515
	Housing, Interior Design, and Resource Management	Dept. Head	18 Wallace Telephone: 231-6163
	Human Nutrition and Foods	Dept. Head	318 Wallace Telephone: 231-4672
8. Veterinary Medicine	Pathobiology	Department Head Admin. Asst.	Phase II, Veterinary Medicine Telephones: 231-7173 231-4291
	Veterinary Biomedical sciences	Department Head Admin. Asst.	Phase II, Veterinary Medicine Telephones: 231-7174 231-4652
	Large Animal Clinical Sciences	Acting Head Adm. Asst.	Phase II, Veterinary Medicine Telephones: 231-4668 231-5999
	Small Animal Clinical Sciences	Department Head Admin. Asst.	Phase II, Veterinary Medicine Telephones: 231-4994 231-7288

**Appendix 4B**  
**Cover Letter for First Mailing**

April 15, 1992

Dr. [First Name] [Last Name]  
[Department]  
[Campus Address]

Dear Dr. [Last Name]:

As you are already aware, the importance of having a well prepared and a properly maintained budget can't be over emphasized. The consequences of poor or inadequate budgeting practices have been felt throughout the University. Budget success ultimately depends on the ability to achieve short-term objectives of the long-term plan, and to equitably distribute resources. Many variables, however, can effect a budget's ability to attain these objectives.

I'd like your help in filling out a brief questionnaire designed to assess the importance of the underlined variables as they effect departmental budgets. As a practitioner your opinion is very valuable to this study.

The questionnaire contains two major parts. In the first part, you are asked to evaluate twenty statements (according to a five-point scale) as they relate to departmental budgets. The second part requests that you, first, select among two alternatives (I or II) in response to statements A through G, and then evaluate the selected statement at the same scale used for the first part. The numbers to the left of the alternatives (I & II) correspond to the answer column for statements A through G.

It should take you about fifteen minutes to complete this questionnaire. Please return the completed questionnaire via campus mail at your earliest convenience. The identification number on the questionnaire and the accompanying campus mail envelop is used only to initiate follow-up requests; your personal responses will not be reported to anyone.

Thank you for taking the time to complete the enclosed instrument. I appreciate your participation.

Sincerely,

Maher H. Masri  
Graduate Assistant



**Appendix 4C**  
**Cover Letter for Second Mailing**

May 6, 1992

Dr. [First Name] [Last Name]  
[Department]  
[Address]

Dear Dr. [Last Name]:

Two weeks ago, a questionnaire seeking your opinion on a list of variables pertaining to departmental budgets within Virginia Tech. As of today, I have not received your completed questionnaire. A second copy and return envelope are enclosed in case it was not delivered or is not conveniently locatable at this time. The identification number on the questionnaire is the same as before and is used only to initiate follow-up requests; your personal response will not be reported to anyone.

Recognizing the critical role budgets play in many institutions, and at Virginia Tech in particular, I have undertaken this study to increase the understanding of what could contribute to the success or failure of budgets. I hope you share my belief in the importance of this study.

If you have already completed and mailed your questionnaire, please accept my sincere thanks. If not, won't you please take a few minutes to complete the questionnaire and return it? The usefulness and accuracy of the results depends on having as large a sample as possible.

Your cooperation will be greatly appreciated.

Sincerely,

Maher Masri  
Graduate Assistant

Encl. (questionnaire and return envelope)

**APPENDIX 5**  
**Questionnaire Opscan Form**

**VIRGINIA TECH BUDGET ASSESSMENT QUESTIONNAIRE**

Use a No. 2 pencil to mark your responses in the answer column according to the following scale:

- |                         |                   |
|-------------------------|-------------------|
| 1) Never                | 4) In Most Cases  |
| 2) In Some Cases        | 5) Always         |
| 3) It depends (Neutral) | 6) Not Applicable |

Budgets aid organizations in the attainment of long and short-term goals by setting up a structure for realizing plans. Within VPI, the success of budgets is dependent on several variables. Please indicate your opinion of the following statements as they relate to departmental budgets.

- 1) Changes occur all the time. Therefore, the responsiveness of budgets to deviations from plans -the ability to detect and correct deviations- is an important feature in assuring their success.
- 2) The perception, by those who have the responsibility of preparing and maintaining budgets, of the importance and the degree of their impact is important for budget success. The greater the perceived importance and impact, the more likely budgets will succeed.
- 3) Response time -the time between actual deviation from plans and the intervention needed to correct these deviations- is also important in assuring budget success.
- 4) Budget flexibility -allowing changes while maintaining the integrity of the goals- plays an important role in assuring its success.
- 5) Budget success is inversely proportional to the frequency of changes in budgeting practices.
- 6) Budget success is dependent on the type and format of budget used (i.e, incremental, zero base, or variable budgets).
- 7) Allowing greater participation in preparing and maintaining budgets positively contributes to their success.
- 8) Increasing the number of individuals and levels involved in preparing and maintaining a budget increases the likelihood of its success.
- 9) Budgets are traditionally prepared for one year, however, extending the budget horizon should increase the chances of budget success.
- 10) The level of education, experience, and training for those who have the responsibility of preparing budgets positively contributes to its success.
- 11) The level of education, experience, and training for those who have the responsibility of maintaining budgets positively contributes to its success.
- 12) Departmental structure and complexity detracts from budget success.
- 13) Budget success is negatively influenced by the number of revenue centers in relation to cost centers.
- 14) The availability of a variety of sources of funds enhances the likelihood of budget success.
- 15) Tying rewards to successful budget preparation and maintenance will insure future success.
- 16) The availability of adequate funds is important to the success of budgets.
- 17) Congruency of goals and objectives at all levels will enhance the chances of success for budgets.
- 18) Giving adequate responsibility for budget preparation and maintenance, and holding individuals accountable for their actions will increase the likelihood of budget success.
- 19) Budget success is positively correlated to the acceptance of long-term and short-term goals by the various stakeholders.

1	1	2	3	4	5	6	7	8	9	10
2	1	2	3	4	5	6	7	8	9	10
3	1	2	3	4	5	6	7	8	9	10
4	1	2	3	4	5	6	7	8	9	10
5	1	2	3	4	5	6	7	8	9	10
6	1	2	3	4	5	6	7	8	9	10
7	1	2	3	4	5	6	7	8	9	10
8	1	2	3	4	5	6	7	8	9	10
9	1	2	3	4	5	6	7	8	9	10
10	1	2	3	4	5	6	7	8	9	10
11	1	2	3	4	5	6	7	8	9	10
12	1	2	3	4	5	6	7	8	9	10
13	1	2	3	4	5	6	7	8	9	10
14	1	2	3	4	5	6	7	8	9	10
15	1	2	3	4	5	6	7	8	9	10
16	1	2	3	4	5	6	7	8	9	10
17	1	2	3	4	5	6	7	8	9	10
18	1	2	3	4	5	6	7	8	9	10
19	1	2	3	4	5	6	7	8	9	10
20	1	2	3	4	5	6	7	8	9	10
21	1	2	3	4	5	6	7	8	9	10
22	1	2	3	4	5	6	7	8	9	10
23	1	2	3	4	5	6	7	8	9	10
24	1	2	3	4	5	6	7	8	9	10
25	1	2	3	4	5	6	7	8	9	10
26	1	2	3	4	5	6	7	8	9	10
27	1	2	3	4	5	6	7	8	9	10
28	1	2	3	4	5	6	7	8	9	10
29	1	2	3	4	5	6	7	8	9	10

OVER PLEASE

A	0	1	2	3	4	5	6	7	8	9	B	0	1	2	3	4	5	6	7	8	9	C	0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- 1) Never
- 2) In Some Cases
- 3) It depends (Neutral)

- 4) In Most Cases
- 5) Always
- 6) Not Applicable

- 30) Budget success is positively correlated to the frequency of review of budget performance.
- 31) Budget success is influenced by management's long-term or short term focus. Budget success should be enhanced as management increases its long-term focus.
- 32) The availability of budgetary slack (slack in the appropriated funds) should increase the likelihood of its success.
- 33) While past successes do not guarantee future ones, a history of successful performance positively correlates to budgetary success.

PART II

For Statements A through G please select either I) or II) and then rank your selection according to the same scale listed earlier.

- A) The purposes of budgets vary. Some budgets are mainly used to control resource expenditure, while others are used for planning.
  - 34-I) The success of budgets is independent of its purpose (planning or control).
  - 35-II) The likelihood of budget success is increased when a budget is intended for control rather than planning.
- B) Different budget formats have different costs and benefits associated with them. For example, the costs associated with using zero base budgeting is greater than incremental budget costs.
  - 36-I) Budget benefits usually outweigh its costs, and therefore, budget success is independent of this variable.
  - 37-II) The greater the costs associated with using budgets, the less likelihood of its success.
- C) Budgets require sufficient time to prepare, therefore:
  - 38-I) Budget success is proportionally dependent on the amount of time allowed to prepare it.
  - 39-II) In order for budgets to succeed, the amount of time allowed for budgeting should be restricted.
- D) The accounting system used in preparing and maintaining budgets (manual or automated system) plays an important role in monitoring budgets performance.
  - 40-I) Budget success is generally independent of the accounting system used.
  - 41-II) Budget success is dependent on the amount of details the accounting system is designed to monitor.
- E) Management/supervisory style (i.e. autocratic vs democratic, delegating vs centralized and/or approachable vs distant) effect budget preparation and maintenance.
  - 42-I) Budget success is largely independent of management/supervisory style.
  - 43-II) Management/supervisory style is important for the success/failure of budgets.
- F) The general economy often induces a level of uncertainty which could indirectly effect the success of budgets
  - 44-I) The success of budgets should be largely independent of the general economy
  - 45-II) There is a positive correlation between the general economy and budget success.
- G) The nature of work and the type of department create contingencies which are unique to each department.
  - 46-I) Budget success is largely independent of the type department or the nature of work.
  - 47-II) The nature of work and the type of department is important for the success/failure of budgets.
- 48) This department systematically prepares an annual budget.
  - 1) Always                      2) Sometimes                      3) Never

30	1	2	3	4	5	6	7	8	9	10
31	1	2	3	4	5	6	7	8	9	10
32	1	2	3	4	5	6	7	8	9	10
33	1	2	3	4	5	6	7	8	9	10
34	1	2	3	4	5	6	7	8	9	10
35	1	2	3	4	5	6	7	8	9	10
36	1	2	3	4	5	6	7	8	9	10
37	1	2	3	4	5	6	7	8	9	10
38	1	2	3	4	5	6	7	8	9	10
39	1	2	3	4	5	6	7	8	9	10
40	1	2	3	4	5	6	7	8	9	10
41	1	2	3	4	5	6	7	8	9	10
42	1	2	3	4	5	6	7	8	9	10
43	1	2	3	4	5	6	7	8	9	10
44	1	2	3	4	5	6	7	8	9	10
45	1	2	3	4	5	6	7	8	9	10
46	1	2	3	4	5	6	7	8	9	10
47	1	2	3	4	5	6	7	8	9	10
48	1	2	3	4	5	6	7	8	9	10
49	1	2	3	4	5	6	7	8	9	10
50	1	2	3	4	5	6	7	8	9	10
51	1	2	3	4	5	6	7	8	9	10
52	1	2	3	4	5	6	7	8	9	10
53	1	2	3	4	5	6	7	8	9	10
54	1	2	3	4	5	6	7	8	9	10
55	1	2	3	4	5	6	7	8	9	10
56	1	2	3	4	5	6	7	8	9	10
57	1	2	3	4	5	6	7	8	9	10
58	1	2	3	4	5	6	7	8	9	10
59	1	2	3	4	5	6	7	8	9	10
60	1	2	3	4	5	6	7	8	9	10

**APPENDIX 6**  
**Pre-Interview Information Packet**

APPENDIX 6  
PRE-INTERVIEW INFORMATION PACKET

**RESEARCH DOMAIN**

**Introduction**

The subject of management control systems<sup>1</sup> has received considerable attention by both researchers and practitioners. Researchers such as Robert Anthony made a life-long career out of trying to define what control is, and how it is different from the other functions of management<sup>2</sup>. Koontz, Donnelly, Markus, Gibbs, and Joerges are only a few of the multi-disciplinary researchers attempting to understand the construct of control. Practitioners (managers), on the other hand, have extensively utilized--and in many cases abused<sup>3</sup>-- such systems; management by objectives, cost accounting, budgeting, and time-event networks (PERT, CPM, & Gantt charts) are only a fraction of the possible number of control systems available to managers.

**Problem Statement**

Although control-related literature is voluminous, it seems to have lost sight of an essential characteristic of a control system; its efficacy<sup>4</sup>. This raises two important questions; the first of which is

1. Given a particular management control system, what is its efficacy?

We can safely hypothesize that management control systems exist, at least within bounds of rationality, to achieve, maintain, or avoid a certain condition. We can also assume that managers adopt such systems for a purpose. Therefore, it is important to know if a

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<sup>1</sup> According to Anthony, "a control system is a system whose purpose is to attain and maintain a desired state or condition." (1980: 3)

<sup>2</sup> No agreement seems to have been reached regarding the number of the functions of management. However, Henri Fayol provides what seems to be the basis for these functions: Plan, organize, command, coordinate, and control.

<sup>3</sup> Merit rating and management by objectives are two examples where control systems have traditionally been abused.

<sup>4</sup> According to the New World Dictionary, efficacy is the "power to produce effects or intended results."

particular management control system is effective or is not (accomplishing the purpose of the manager, and/or satisfying the condition for which it was designed). Such knowledge would also aid in designing control systems with optimum efficacy in mind, or selecting control systems which are more likely to attain the purpose which they are intended for. Even if the design or selection of a control system is not feasible, the manager will know, in advance, how much effort to place on any of the available control systems given their efficacy.

"Efficacy" is an ambiguous term, especially when referring to control systems. To clear up this ambiguity requires defining what efficacy is and, hence, leads to the second question.

2. What determines the efficacy of a management control system? What are the characteristics, attributes, measures and magnitude, and/or features which determine if a control system is effective or is not?

The first question seems more important, but to answer it the second question becomes more immediate.

### **Subproblems**

Enumerating what determines the efficacy for a given control system alone, does not provide the needed visibility to later answer the second question. We should also differentiate among efficacy variables in terms of their importance and impact. To do so, we must address the following subproblems:

1. Can efficacy variables be categorized into subcategories as they relate to
  - a) the use of the control system,
  - b) inherent characteristics of the control system
  - c) the users<sup>5</sup>, or
  - d) the purpose of the control system under study?

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<sup>5</sup> Refers to the characteristics of the users as well as external factors that might affect how the control system is being utilized. The external factors relate to the level of the organization, its structure, and possibly the environment within which the organization operates.

2. What is the relative importance of each of the variables? The impact of some variables may be greater than others. Knowing which variables are most important allows the setting of priorities in evaluating them. Furthermore, some variables may have negligible impact that they could be eliminated from any further analysis.
3. What are the possible relationships between the variables? It is very likely that the interaction between some variables can produce a greater effect than they would have done individually. It is also possible that some variables counteract each others' effect.

### **Research Question**

Given time and resource limitations, the prudent approach would be to narrow the focus of this research to only consider **budgeting** as the control system in question. Specifically, addressing the following question.

**What determines the efficacy of budgeting (revenue and expense budgets) as a control system? In other words, what are the variables that determine the efficacy of budgets when used as management control systems?**

By asking this question, I do not expect the mere listing of variables. I expect to also know more about the relative importance of each of the variables and, if possible, the interactions between them.

### **Research Objectives**

The proposed research will attempt to attain the following objectives.

1. Identify the variables that can affect the efficacy of revenue and expense budgets.
2. Assess the importance of each of the variables and their impact on the efficacy of budgets.



3. Select a subset of these variables (approximately twenty percent of the total) which account for the majority (at least eighty percent) of the impact on the efficacy of budgets.
3. Model the efficacy of budgets as a function of these most important variables.

## METHODOLOGY

The proposed methodology will be composed of four phases as shown in Table 1.

### **Phase 1. Literature Review**

The objective is to identify some efficacy variables to be used as primers for the second phase of the methodology. The investigated literature included the disciplines of management control systems, budgeting, management, engineering, psychology, and sociology.

The variables identified from the literature are show in Appendix A, and are organized according to the following categories.

- a) The purpose of budgets. Every budget is unique in how it is used, and the purpose for which it is intended.
- b) The use of budgets. Budgets differ, not only in how they are utilized, but also in the features they offer users. These features determine, for example, the level of complexity, flexibility, cost, and utilization of budgets.
- c) Inherent characteristics of budgets and the budgeting cycle. All budgets attempt to allocate scarce resources among alternative courses of action. Furthermore, the budgeting cycle (planning-controlling-planning) is the same (or at least should be the same) for all budgets. Therefore, the degree of success for budgets could depend on how some of the features, inherent in the budget and its cycle, are utilized.
- d) The users of the budget. The difference in how budgets are used could also be attributed to their users, as well as to specific organizational factors. Users differ in many ways, including education, experience, and training. Organizational factors include the level of the organization, its structure, and the environment within which the organization operates.

### **Phase 2. Personal Interviews**

The objectives of these interviews are to: a) allow experts to contribute any additional variables they deem important, b) clarify and combine "similar" variables (in order to avoid semantics problems), and c) get a feel for which variables are most important and which ones are least important.

The interviews will be structured around the following questions:

- I. Given the variables found, what other variables do you think are important when considering the efficacy of budgets as a control "system/mechanism"?
- II. Of the variables identified so far, a) which ones are not clearly understood by practitioners, and b) which ones can be combined?
- III. Of the remaining variables, which ones do you consider most important, and which ones are least important?

**Table 2. Methodology Phases, Sources of Information, and Expected Output**

<b>Methodology Phase</b>	<b>Source of Information</b>	<b>Results</b>
1. Literature Review	Literature in the fields of Management, Psychology, Engineering, and Sociology.	A short list of efficacy variables used as a primer in the second phase of the methodology.
2. Personal Interviews	"Experts" opinions.	<ol style="list-style-type: none"> <li>1. Identification of other variables</li> <li>2. Clarification of possible confusion, and combination of redundant variables.</li> <li>3. Opinions on the importance of these variables.</li> </ol>
3. Questionnaire	Opinions of practitioners and researchers in the areas of budgets and management control systems.	<ol style="list-style-type: none"> <li>1. Ranking of the variables according to their importance.</li> <li>2. Identification of most important variables (top 20%) that could account for much (80%) of the efficacy of budgets as control systems.</li> <li>3. Assigning weights to the variables based on the responses to the questionnaire.</li> </ol>
4. Modeling	The weights and correlation factors calculated in questionnaire phase	A simple and linear mathematical model describing the efficacy of budgets as a function of the most important variables.

## **Proposed Efficacy Variables**

While the distinction between variables according to the proposed categories is not always clear, these categories helped point out some variables that would have been missed otherwise. Preliminary research indicates the following are some of variables impacting the efficacy of budgets.

- 1) Related to purpose of budgets
  - a) The impact budgets have on accomplishing plans (critical contribution). That is, what contributions do budgets have in accomplishing plans.
  - b) Objectives of budgets. Some budgets are prepared solely for control, while other budgets are needed to aid management in attainment of organizational goals.
  
- 2) Relating to use of budgets
  - a) Cost/revenue ratio of the use of budgets. In other words, would the benefits of using budgeting outweigh its costs.
  - b) The responsiveness of budgets to deviation from plans; how well do budgets detect and correct deviations from plans.
  
- 3) Relating to budget characteristics and mechanics
  - a) Flexibility. Budgets are not ends in themselves. Budgets are first planning tools and then control tools.
  - b) Allowing changes to budgets while maintaining the integrity of the purpose.
  - c) Time frame for preparing budgets.
  - d) Previous budgeting practices. Previous practices often leaves traditions and supporters which might undermine efforts for changes.
  - e) Type of budget.
  - f) Number of individuals and organizational levels involved in preparing and maintaining the budget(s).
  - g) Budget horizon.
  
- 4) Related to budget users
  - a) Level of education/experience/training for those who have the responsibility of preparing budgets
  - b) Level of education/experience/training for those who have the responsibility of maintaining budgets
  - c) Management style. Management can be autocratic or democratic, delegating or centralized, and/or approachable or distant.

- d) Organizational structure. Including chain of command, size of the organization, number of management levels, number of employees, and whether or not labor unions are present in the company.
- e) Type of business. Would a manufacturing firm, for example, stand a better chance at effectively prepare and maintaining their budgets than would a service firm do?
- f) Number of profit centers in relation to cost centers. Budget complexity should increase as the number of profit centers increase.
- g) The profitability/loss of the institution. While 'sound' budgeting practices should result in higher profits (all things equal), the profitability of a company may afford it enough slack to ensure the effectiveness of its budget(s).

**MAHER MASRI**  
1009 Kabrich St  
Blacksburg, VA 24060  
(703) 951-8291

**PROFESSIONAL**

**OBJECTIVES:** To improve and facilitate the integration of people, systems, and technology with the purpose of increasing productivity of individuals and enhancing overall performance.

**EDUCATION:**

(Current) Masters of Science, Virginia Polytechnic Institute and State University.  
Major in the Management Systems Engineering option of the Industrial and Systems Engineering Department

Masters of Science, Oklahoma State University  
Major in Industrial Engineering and Management

Bachelor of Science, July 1985, Oklahoma State University  
Major in Industrial Engineering and Management

**TECHNICAL CAPABILITIES:**

In-depth Knowledge of:

- Personal Computers (hardware and Software)
- Performance/Productivity Measurement and Improvement.
- Manufacturing Processes, Robotics, Time Study, and Methods Engineering
- Work/Office Automation and Management Information Systems
- Communications; Data and Voice (Telephone Exchange, Local Area Networks, Wide Area Networks, Standards, etc.)

**WORK EXPERIENCE:**

1987 - 1989      Methods Engineer: Responsibilities included; coordination and implementation of work/office Automation plans, conducting departmental; performance evaluation and productivity measurement, conducting appraisal studies for industrial projects, and evaluation the costs and benefits for proposed systems and procedures.

1986-1987      Full Time University Lecturer: Taught Quantitative Methods for Business, Production Control, and Management of Information Systems. Also conducted courses on Personal Computers usage and applications for faculty and students.

**ACCOMPLISHMENTS:**

Partial Listing      Conducted a plant layout and material handling study for a plastic manufacturing plant.

Established preventive maintenance policy for large printing presses (Moore Business Forms). The new maintenance policy had potential savings of \$500,000 per year in down-time cost alone.

Coordinated an Office Automation and Local Area Network study for a twenty-one story building expected to accommodate 1000 employees.

**PERSONAL:**

Married, 2 children

U.S. Citizen