

APPLICATIONS OF QUALITATIVE AND QUANTITATIVE
TECHNIQUES OF MANAGEMENT IN ADMINISTRATIVE/ACADEMIC
DECISION-MAKING IN INSTITUTIONS OF HIGHER EDUCATION IN
VIRGINIA

by

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Abstract

The purpose of this study was to examine the status and extent to which administrators of colleges and universities in the state of Virginia apply qualitative and quantitative techniques of management in planning, directing, reporting, and controlling activities for enhancing their administrative and academic decision-making capability.

The study was directed to the top and operative organizational levels in two categories of administrators (nonacademic and academic) to determine the types of managerial techniques used, degrees of familiarity with these techniques, frequency of use, managerial benefits and constraints, and individual and organizational factors involved in using such techniques. The qualitative and quantitative techniques were selected from diverse sources of related literature.

The study followed guidelines of exploratory and descriptive research. Data were collected through a questionnaire mailed to 288

administrators of twelve randomly selected colleges and universities in Virginia. The study was limited to institutions granting at least a four-year baccalaureate degree and having a total enrollment of at least 1,000 students. Data were analyzed using descriptive statistics and factorial analysis of variance to describe administrators' decision-making capability in terms of the extent of utilization of the selected techniques.

Based upon a 55 percent response rate, the findings show that administrators have moderate knowledge about the techniques and their extent of use is fairly low. No significant statistical differences in the degree of familiarity and extent of use with various management techniques (qualitative and quantitative) either by category of administrator assignment (nonacademic and academic) and by level or type of administrator (executive and operative) was found. The most reported techniques related to familiarity and extent of use were Brainstorming, Checklists, Benchmarking and Cost-Benefit Analysis. Respondents positively use and perceive the value of qualitative techniques more favorably than the quantitative techniques for decision-making. Results of this study may be of benefit to both practitioners and academicians. Based upon this study's findings, practical implications are discussed. Limitations and suggestions also are made for future research into this topic.

Teresa Hernandez de Valero

In memory

1916-1994

She was a great woman. She was my mother who in her own way, always thought that “education” is the best gift parents could leave their children. She died while I was distant; a stranger in a strange land. Though I think that today she is probably very happy to know that our intentions and courage have overcome obstacles for receiving and giving education. She must be very proud, above all, to know that the tradition she started continues with our children and our people.

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I am grateful for the support of my family. I could not have completed this project had it not been for the support and encouragement of my wife, Yaritza. This project has not been merely my dream, but our

dream, and together we pulled it off! I hope that the future will prove that the effort was worth the price, and that together we can enjoy the rewards.

Our children, Carlos Jr. and Oscar, demonstrated an understanding and maturity during the years that we were a family of students. They helped me with motivation and computer expertise, and the best of all, they valued our efforts as they pursued their own academic objectives. My little girl, Carla, may not have understood what I have been working on, but without her love, joy, and distractions this work would have little meaning. I promise to compensate them for their concessions and time sacrifices over the upcoming years.

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CHAPTER I

Introduction

During its evolution, administration has been recognized by practitioners and scientists as both an art and a science. As an art, it is considered that administration is informed by sensibilities, perceptions, and intuitions. The administrator as an artist tries to create new realities and to influence others as he or she enacts the surrounding environment. As a science, administration is directed by an understanding of structure, schedules, systems, and power. The administrator as a scientist collects and analyzes information, assesses relationships, infers causality, and generates and tests hypotheses (Nisbett & Ross, 1980).

Trying to lead without art is usually sterile; trying to lead without science is usually ineffective. Good administrators are probably both artists and scientists, and are able to integrate the two ways of thinking and of processing data (Birnbaum, 1988).

The science of educational administration is as new as the modern school (Hoy & Miskel, 1982). Classical organizational thought, also called administrative management theory, started with scientific analysis of work and efficiency (Taylor, 1967), and later dealt with concepts and principles of bureaucratic theory, such as hierarchical structure, authority, procedures, and rationality (Weber, 1983). These concepts were integrated into the administrative functions of planning, organizing, leading, and controlling (Fayol, 1987), and describing what administrators do and how they act today (Hellriegel & Slocum, 1992).

The scientific management revolution of the early 1900s provided the

foundation for a behavioral science approach and quantitative studies in organizations.

Theoretical formulations in behavioral science (qualitative studies) integrated concepts and propositions drawn from psychology, sociology, political science, and economics, providing an interdisciplinary framework that later would influence the behavior of members of organizations (Gibson, Ivancevich & Donnelly, 1991)

Quantitative studies of management have generally been considered to have originated during the World War II period, when operations research teams were formed to deal with strategic and tactical problems faced by the military. These teams, which often consisted of people with diverse specialties (e.g., engineers, mathematicians, and behavioral scientists) were joined together to solve common problems through the utilization of scientific methods (Anderson, Sweeney, & Williams, 1994). After the war, many of these team members continued their research on quantitative approaches to decision-making, leading to the growth and use of management science in nonmilitary applications such as manufacturing, health care, engineering projects, transportation and traffic studies, communication, business, and educational administration.

Concurrent with these methodological developments, system analysis was developed. It represents one approach to solving problems within the framework of systematic output followed by feedback. Thus, information systems facilitated the advance of computer technology. Numerous software programs were written to develop variants of the post-World War II methodological approaches, allowing for solutions to more complex and

larger problems than those requiring only intuitive, simpler solutions (Robbins & DeCenzo, 1995).

The contingency viewpoint or the situational approach is the most recent school of thought about management. In essence, managers who follow this approach can use any other viewpoint, depending on the current circumstances. Managers or administrators should consider the three key contingency variables of environment, technology, and people, before making a decision (Hellriegel & Slocum, 1992).

Background to the Problem

Victor Baldrige (1971), a researcher on the administration of postsecondary organizations, can be recognized as one of the earlier academicians to examine theories and practices identified with management science studies in university settings. His analyses of management included the operation of professional offices of institutional research, the use of quantitative techniques as a basis for making decisions about the internal allocation of resources, and a growing reliance upon automatic data-processing equipment in the everyday processes of university administration. Baldrige concluded that, used with discretion, quantitative analysis had been thus regarded as a highly valuable instrument for management planning and decision-making in the institutions included in his survey. Baldrige claimed that more rational techniques--that is, techniques which permit an objective comparison of alternatives in terms of specified goals--should permit institutions to achieve greater efficiency and fairness in their internal operations.

Some studies on institutions of higher education analyzed similarities and differences between educational institutions and other types of organizations. Some concluded that colleges and universities were difficult to administer because they are different from other organizational systems. For instance, Cohen and March (1974) stated that institutions of higher education are conducted as organized anarchy; Weick (1976) pointed out that such institutions are loosely coupled organizations because they present qualitative and quantitative disparities in structure, processes, and goals.

Others researchers concluded that there were vast differences in origin, size, instructional quality, standards, governance, program variety, sources of support, and purposes within and among the colleges and universities in the American system (Feldman & Newcomb, 1969; Stoke, 1966; Wilson, 1965a). This diversified structure of institutions was an administrative fact worthy of consideration (Hungate, 1964; Stoke, 1966). Stoke, for instance, concluded that “understanding the differences between institutions is an important key to successful administration” (p. 40).

Diverse academicians, convinced that colleges and universities are very different from other organizations, claimed that management techniques and tools applied in common corporations are not appropriate for colleges and universities (Saurman & Nash, 1975). Others concluded that any transfer of managerial techniques or procedures taken from industry and translated to administration in higher education would be impossible because many of these processes, generally, inhibited initiative and creativity (Brien, 1970; Knapp, 1969; Robinson, 1970). However, there were sources that reported that the effective educational administrator must not use

arbitrary methods of administration (Mcgrath, 1970; Perkins, 1970; Sanford, 1970).

In the same vein, Corson (1960) suggested that, in some respects, a closer approximation to business organizations could be healthy. He underlined the distinctions among governance, planning, and administration in colleges and universities. He pointed out that campus governance encompasses three major managerial functions: planning, execution, and control. Corson stated:

Planning is directed toward determining the frame of reference for current decisions. As such, this is an integral part of and virtually synonymous with the decision-making process. The planning and decision-making function involves analyzing the current situation, identifying goals, deriving objectives from goals, formulating policies, developing effective strategies or courses of action, and allocating resources. Execution is the process of carrying out the planned actions by those responsible for achieving agreed-upon results. The control function is the measurement of progress toward and achievement of institutional objectives. (p. 69)

Properly considered, currently, administrations of institutions of higher education perform these three managerial functions with the appropriate participation and support of technicians, professional administrators, faculty, students, and other major constituents (Clark, 1972; Chaffee, 1983; Dill, 1984; Green, 1969; Hungate, 1964; Mintzberg, 1979). All of these activities undertaken by administrators involve a focus on decision-making and problem-solving. Decision-making is often referred to as the heart of the management/administrative process (Mann, 1976). Problem-solving may be considered in a somewhat broader context than

decision-making, in that it involves interpreting, bargaining, and compromising, as well as decision-making (Foxley, 1980).

During the late 1970s and early 1980s, a great deal of optimism developed over what was then thought to be an untapped potential for management science applications in higher education administration. Many colleges and universities were faced with tough resource allocation decisions in applying dynamic processes of action to increasing enrollments and institutional competence. Management scientists began to suggest that they could offer some better problem-solving techniques for decision-making. Abundant literature was published describing, and, in most cases, proposing behavioral approaches, organizational methods, and computerized models for various levels and diverse administrative problems. For example, a great amount of research included treatments of leadership and decision-making (Clark, 1983; Cohen & March, 1986; Fiedler, 1976; Vroom, 1983), organizational culture (Baldrige & Deal, 1983; Chaffee, 1983; Mintzberg, 1979;), structure and functional designs (Alpert, 1985; Clark, 1983; Millet, 1978;), productivity and participation (Astin, 1980; Powers & Powers, 1983), governance and policy (Baldrige, 1974; Birnbaum, 1984; Bothwell, 1986), organization development, strategy, and change (Cameron, 1984; Kurpius, 1980; Levine, 1980; Whetten, 1981), and institutional effectiveness (Cameron, 1978, 1983, 1984; Chaffee, 1987; Steers, 1978; Whetten & Cameron, 1985).

The National Center for Higher Education Management Systems (NCHEMS) also produced literature on approaches to decision-making and techniques for supporting it. From various perspectives, theoretical and

practical studies addressed organizational adaptive/innovative capabilities in management in diverse areas of educational administration.

Many of these studies provided critical insights into organizing frames of reference for understanding the administration and administrative processes in institutions of higher education. However, literature related to the effective implementation and the extent of use of behavioral and quantitative methods in the problem-solving and decision-making processes, in diverse institutional areas, were limited in some respects.

Past research examined the role of quantitative methods in business management (Hesse, 1980; McArthur, 1980; Zahedi, 1983). Surveys to identify the extent to which managers do, or do not, use quantitative techniques in settings different from education were reported (Coccari, 1989; Green, 1977; Kathawala, 1988; Shannon, Long, & Buckles, 1980).

Diverse quantitative models for education were developed and their implementation discussed (Bessant & Bessant, 1980; Bleau, 1981; Bloomfield & Updegrove, 1981; Hopkins & Massy, 1981; Lassiter, 1983; Zufryden, 1983), but, definitive research on the extent of the use of qualitative techniques in higher education administration was minimal or non-existent.

Statement of the Problem

The challenges brought about by change during the last decade have removed traditional constraints, enabling administrators to focus on their organization's overall corporate strategies. Effective administrators must know managerial techniques and must be able to take them into account as bases for their actions and expectations. The ability to deal effectively with

other people, and in particular, to accomplish work through others, has and will remain a fundamental ingredient in the management process. This is especially true where relatively complex problems are undertaken by management groups, such as is found in the setting of university administration. Human relations skills are certainly necessary, but, increasingly, they are not sufficient for managing complex educational organizations. Technical competence is also required for numerous and varied tasks. Activities that require scheduling, for instance, include courses, sports events, preventative maintenance, and counseling. Cost analysis is involved in such diverse areas as program and course costing, budgeting, purchasing, insurance, planning the new construction of buildings, and determining the amount and types of fringe benefits for employees (Hentschke, 1975).

Ideally, during the last twenty five years, educational institutions have prepared numerous and capable specialists and professionals with the necessary skills to administer academic institutions efficiently and effectively. Theories of administration, organizational development, and the behavioral disciplines have provided qualitative patterns and knowledge, including creative problem-solving, team building, force-field analysis, nominal group technique, brainstorming, goal-setting, management by objectives, theory “x” and “y,” check lists, analyses of participatory management, job evaluation, empowerment, and management information system (MIS).

On the other hand, management science, statistics, and quantitative disciplines have also supplied quantitative methodologies, including network

analysis (program evaluation review technique, critical path method), forecasting (regression, path analysis, time series), cost-benefit analysis, optimization (linear programming, assignment, transportation), sensitivity analysis, significance testing, simulation, benchmarking, and total quality management (TQM). Moreover, decision support systems and computers based on these programmed techniques are increasingly being used for enhancing people's capabilities and organizational life.

Recently, there have been relatively rapid advances in the use of large amounts of data and in the development of new techniques for their analysis. Educational administrators are being particularly challenged by declining resources. Prescriptions and strategies for dealing with fiscal crises in higher education are many, ranging from downsizing to restructuring, from academic program review to strategic planning, from marketing to total quality management, and from system rationalization to curriculum consolidation and discontinuation (Michael, 1995). An increasing number of administrative and educational problems confronting colleges and universities have become so complex and involved, with so many possible solutions, that it is very difficult, or almost impossible, to select intuitively the best solutions within an organizational network (Simon, 1993).

Behavioral scientists have argued that decision-makers faced with complex problems cannot find, and perhaps should not seek, the best possible solutions. However, acknowledging the limited use of rational processes of administrators, some management scientists have urged the use and application of simpler models that assist decision-makers in identifying and evaluating marginally better alternatives (Keen, 1977).

It is assumed that the modern administrators' challenges may be faced through successful applications of most of these techniques. If limited resources are to be put to use, managerial techniques have a crucial part to play in processing the information needed to operate an effective administrative planning, executing, reporting and controlling system which, today, is an essential requirement for institutions of higher education.

According to Dunn (1994), almost all organizational problems are interdependent, subjective, artificial, and dynamic. Problems rarely may be separated into independent, discrete, and mutually exclusive parts; problems are really systems with teleological (purposive) properties, such that the quality of the whole is different from the quantitative sum of the parts. If this reasoning is integrated into the decision-making process, then administrators would be able to face problems encountered in their daily tasks by analyzing multiple alternatives. Qualitative and quantitative analyses (behavioral and mathematical techniques) can provide a diversity of knowledge.

Qualitative analysis is based primarily on the administrator's judgment and experience; it includes the administrator's conceptual and interpersonal ability to understand that behavioral techniques help to solve problems. Qualitative analysis is considered more as an art than a science. If the administrator has had little experience with nonroutine problems, or if a problem is sufficiently complex, then a quantitative analysis might be a very important consideration for the administrator's final decision-making.

Quantitative analysis concentrates on the facts, data, or quantitative aspects associated with problems. An administrator's educational, and

technical knowledge of quantitative procedures help to enhance the decision-making process. When using a quantitative approach, an administrator will concentrate on and develop mathematical expressions that describe objectives, constraints, and other relationships that exist in the problem.

Educational administrators may enhance decision-making capabilities by learning more about quantitative methodologies, and by better understanding their contributions to the decision-making process. An administrator who is knowledgeable in quantitative decision-making procedures is in a much better position to compare and evaluate the qualitative and quantitative sources of information and, ultimately, to combine alternatives to make the best possible decisions.

Administrators must recognize, adjust to, react to, and accommodate many diverse behavioral situations which permeate the college and university organization. Central to the educational administrator's problems are the many individuals and groups, including upper and middle management in their organizations, staff groups, task forces, subordinates, other administrators, direct and support groups, and sometimes public officials, who continually present problems associated with organizational behavior interventions.

Ultimately, the use of specific managerial tools can significantly contribute to boosting the administrative capacity to deal with turbulent organizational environments. Behavioral methods and quantitative techniques in organizations are closely related, and when applied to problems they are

essentially productivity tools (Foxley, 1980).

It is the underlying premise of this study that the use of managerial aids--both qualitative and quantitative--are of vital importance for a sound and effective decision making process. Decision-making is, in fact, psychotechnical (Morris, 1972): the psychological use of information incorporated into the administrator's decision-making style often is combined with the practical and technical existence of information. Thus, administrators may enhance their decision-making capabilities by learning, understanding, and using various management science methods.

Purpose and Objectives

The purpose of this study is to examine the position of the administrator and the extent to which administrators of colleges and universities in the state of Virginia adopt qualitative and quantitative techniques of management in planning, directing, reporting, and controlling in order to effectively enhance their administrative/academic decision-making processes.

The study focuses on two categories of managers (nonacademic and academic), and two levels of managerial functions (executive and operative), in order to determine the types of techniques used in each category and level, the degree of familiarity with diverse techniques, the frequency of use, the managerial benefits and constraints, and some individual and organizational factors involved in implementing such techniques.

The following objectives frame this study:

1. To determine and select specific qualitative and quantitative techniques that are commonly used in the decision-making and problem-solving processes in educational organizations (colleges and universities).

2. To evaluate the existing literature describing theoretical and practical studies of the managerial tools that are the focus of this research. And further, to evaluate the literature concerning the extent of use of qualitative (behavioral) and quantitative techniques in organizations, and the roles of these techniques in the educational administration environment.

3. To identify within the different organizational structures of institutions of higher education a frame of reference for classifying administrators in academic and nonacademic categories, and to define levels or functional areas where those managerial techniques might have real or potential applications and may be used effectively.

4. To examine the possible relationship among the different categories and levels of administrators and frequency of use of the selected qualitative and quantitative techniques that might be related to the administrator's decision-making processes in institutions of higher education in the state of Virginia.

Based on these objectives, and of particular relevance to the fourth objective, a series of research questions have been formulated, which constitute a major part of this research effort.

Although it would be possible to state the research questions as strict formal hypotheses, this research follows the guidelines of exploratory and descriptive research, drawing conclusions based upon the analysis of the empirical data collected.

Research Questions

Based upon the purpose and objectives formulated, several research questions have been developed.

1. What kind of managerial methodologies, among qualitative or quantitative techniques, are more familiar to administrators for use in their decision-making processes and tasks?
2. To what extent are administrators using selected qualitative and quantitative techniques in carrying out their managerial functions of planning, directing, reporting and controlling?
3. At what functional level of services--nonacademic and academic--do managers possess the highest degree of familiarity or expertise in using qualitative and quantitative techniques?
4. Do administrators differ in the extent of their use of the management techniques by category type (nonacademic and academic), and by functional levels (executives and operatives)?
5. What type of benefits do administrators perceive from using qualitative and quantitative techniques in their decision-making processes?
6. What kind of constraints do administrators commonly encounter in implementing qualitative and quantitative techniques in decision-making at colleges and universities?
7. Have the administrators received institutional training in the selected techniques to enhance their decision-making processes?
8. How are selected administrators' personal and institutional characteristics associated with the utilization of selected qualitative and

quantitative techniques? Personal characteristics include: (a) education, (b) experience, (c) managerial skills, and (d) decision-making styles.

Organizational characteristics include: (a) training and (b) extent of computerization.

Specifically, an examination of these variables will be conducted and the relationship among them will be discussed by using the following subset of questions:

a. Have the administrators an adequate level of education that supports the extent of use of behavioral and quantitative techniques at their institutions?

b. Have the administrators adequate years of service or experience associated with the extent of usage of behavioral and quantitative techniques?

c. Are the administrators applying rational decision-making methods (conceptual and interpersonal skills) for analyzing relevant problems at the departmental unit in their organizations?

d. What style of decision-making is more frequently perceived as being applied in their institutions or departmental units?

e. Are the administrators using software packages and computer instruments for analyzing data or solving problems in their departmental units?

Significance of the Study

This study is of benefit to both practitioners and academicians. For practitioners, a better understanding of the nature of the gap between theory

and practice could help them evaluate alternative techniques. Academics in the field of higher education administration could use this knowledge to tailor their teaching and research more effectively to real-world needs. Although the importance of adopting managerial techniques for enhancing decision-making processes in industrial and other types of organizations, has been emphasized in the literature, little research has been conducted specifically to examine the administrators' position and the extent of use of some techniques in institutions of higher education at the state level.

The rationale for the study is predicated on the belief that informed opinion is always valuable. The examination of different type of managerial techniques as well as a series of personal and organizational variables, that may be influencing the decision-making process in colleges and universities, may provide valuable insights for designing future strategies to facilitate the adoption of these methods and could enhance the administrator's capability and organizational performance.

The findings of this study could be useful for enhancing commitment, individual and collective decision-making, improving communications, stimulating more meaningful training and development, and enhancing the participation of people in innovative processes and change.

Because of economic pressure, the demand for enhanced quality of services, and for accountability to the authorities of the Virginia system of higher education, administrators are required to cope with the complexities of changing responsibilities. The findings of this study could also serve as

feedback mechanisms about administrators' level of preparation to meet these challenges.

Contemporary and future administrators must possess the academic and experiential know-how necessary to understand the methods and technologies that they are managing. Administrators and educators must recognize that the sources of future technical managers and professionals are shifting and that special educational and training programs will be necessary for updating and redirecting their tasks and capabilities.

It is hoped that this study will assist educational administrators in developing their knowledge about qualitative and quantitative techniques, and about the ways these methods might be applied in their institutions to achieve positive results in improved decision-making.

Limitations of the Study

This investigation is limited to four-year colleges and universities, public and private, operating in the state of Virginia, and that have enrollments of at least 1,000 or more students. It did not include organizations in other regional educational systems, or national systems, although a significant number of studies on the use of selected decision-making techniques have been done in those areas.

The study discusses a limited number of qualitative and quantitative techniques previously selected from empirical and practical studies.

This study also is limited to applications to the administrative and academic subsystems in the selected institutions.

The concepts related to decision-making and problem-solving are limited to the functions of planning, directing, reporting, and controlling activities.

This study examines only some of the variables related to the role and extent of the use of qualitative and quantitative techniques influencing administrators' decision-making processes. Therefore, it does not explore more detailed theories about decision-making processes nor does it explore external environmental and organizational policies.

The differences in knowledge, degree of authority, managerial style, level of professionalism, and experience of the administrators, related to the diverse managerial techniques, might possibly be a limiting factor in completing the data. In this sense, a set of definitions about the techniques studied is attached to the questionnaire to be used by the respondents.

The weakness inherent in the use of questionnaires to collect the type of data needed for this study might impact the validity or reliability of the data.

Definition of Terms

Qualitative Techniques. Qualitative techniques are managerial aids concerned with the development of any appropriate utilization of rational approaches of intervention in human affairs (Checkland, 1985; Jackson & Keys (1984).

Quantitative Techniques. Quantitative techniques are mathematical and statistical models describing a diverse array of variables' relationships,

and are designed to assist administrators with management problem-solving and decision-making (Naude, Stray, & Wegner, 1991).

Nonacademic Administrators. A nonacademic administrator is a person in charge of planning, organizing, coordinating, controlling, and managing all the administrative functions of one department, unit, or educational institution.

Academic Administrators. An academic administrator is a person in charge of planning, organizing, coordinating, controlling, and managing all the academic components of one departmental unit, college, school, or educational organization.

Planning. Planning is the formal process of deciding in advance what is to be done and how. It involves selecting objectives and developing policies, programs, and procedures for achieving them. Planning prescribes desired behaviors and results (Hellriegel & Slocum, 1992).

Directing. Directing refers to the conduct of affairs of the organization or departmental unit. Directing involves management coordination and execution toward objective accomplishment by means of an information-decision system. Typically, individual and organizational behavior involves a continuing sequence of planning-directing-controlling cycles (Kast & Rosenzweig, 1980).

Reporting. Reporting refers to presenting or submitting, often officially, the analysis and results of tasks, projects, reports, or studies to internal or external officials or interested agencies.

Controlling. Controlling refers to the methods and mechanisms used to ensure that behaviors and performance conform to the

organization's objectives, plans, and standards. Controls help maintain or redirect actual behaviors and results. Thus, planning and controlling complement and support each other (Hellriegel & Slocum, 1992).

Rational Decision-Making. Rational decision-making refers to a logical and rational process of deciding among diverse alternatives, that permits managers to think in terms of relative priorities, rather than ironclad objectives and criteria (Hellriegel & Slocum, 1992).

Brainstorming. This technique provides a highly effective means of supplying new ideas and innovations as source of information. The approach is very simple, with few rules and a relatively unstructured approach. A small group of personnel who share a common problem are brought together and asked for ideas. All suggestions, however unrealistic, are recorded in detail and then voted upon for further more detailed examination. Proposals may emerge and be passed through to higher decision-making levels in the organization (Bloor, 1987).

Checklists. This technique consists of formulating carefully a series of questions applicable to any activity, procedure, job, department, policy, or other component of the organization. It is a process easy to prepare. The presence or absence of specific attributes in each alternative are checked and the alternatives are rank-ordered on the basis of the number of attributes present (Johnson & Kazense, 1993).

Force-Field Analysis. The force-field technique holds that one way to think about attacking and eliminating the cause of a problem is to regard it as the stationary product of forces working in opposite directions. There are forces that are operating to remove the cause of the problem, and forces

that are working to keep it there. Positive forces are called the helping or “pro” forces, and the negatives, that tend to retain the causes, are called obstacle or “against” forces. The strength of the opposing forces is represented by varying lengths of arrows. There is no limit to the number of forces on either side; the sum of the “pro” and “against” forces will have to be equal if problem results are to remain unchanged. If the sum of “pro” forces (in an upward direction) is greater, result should improve. On the other hand, if the “against” forces (in a downward direction) are greater the result could worsen.

The technique provides a clear display of the complexity of those forces for or against a decision, and frequently explains why a problem has not been corrected, even though the solution may have been known for years. Moreover, it can help identify sources of resistance to change as well as resources and factors enabling change. It is especially helpful in evaluating alternatives in the decision-making process, and in anticipating implementation issues (Gillispie, 1987).

Job Enrichment/Enhancement. This technique is designed to give greater freedom in the way in which jobs and tasks are performed. Selected jobs are scrutinized for highly repetitive, boring, dull, or non-important aspects. The main purpose of job enrichment is to raise individual self-motivation and satisfaction without prompting an automatic pay raise or changing the job beyond all recognition (e.g., developing a curricula outline for a determined course and assisting professors in implementing it).

Application of the technique assumes that the accountability of the individual for his/her own work will need to increase--a fact which often

meets with some opposition. Enhancement usually relates to the expansion of similar tasks (e.g., developing a curricula outline for an assigned course as well as collaborating in the development of others).

Administrators who accept the basic premises of job design may be involved in any one of the several design activities. There are many standardized instruments available for diagnosing job content and individual satisfaction and motivation (Finch, 1985).

Management by Objectives. Management by Objectives (MBO) is a management approach which specifies in advance the results to be achieved and the program steps required for the achievement of those results. It is a management philosophy built upon a number of assumptions about people, supervision, and performance appraisal. It is a process in which senior and subordinate managers of an organization jointly identify organizational goals, define each individual's major areas of responsibility in terms of results expected, and use these measures as guides for operating the unit and assessing the contributions of each of the unit's members.

Successful application of this technique raises the level of participation and commitment in the meeting of common goals and sharing problems. The technique requires some participation in goal setting, diagnosis, the use of feedback, and a general climate of cooperation, among other things (Bloor, 1987).

Management Information System. Management Information system (MIS) is a communication structure set up to collect, organize, store and retrieve data which are needed in making organizational decisions. An MIS is typically used in patterned, habitual task areas where spotty and

incomplete information should be replaced by a system of catalogued and interpreted information. An MIS is designed to provide organizational decision-makers with a system of more useful, comprehensive, timely and accurate information.

There are three basic elements to an MIS--the data themselves, the communication network established to collect, update, organize, store, and retrieve the data, and decision tools used to assist the decision-maker in analyzing and interpreting the data (e.g., simulation models, linear programming). Although information systems can function without the use of the computer, the time demands for information and the volume of data needed in making decisions has made the computer a critical part of most MIS (Sandin, 1977).

Nominal Group. This technique is a very structured group process involving three distinct phases: independent written idea generation by each participant, round-robin concise sharing by all group members, and a mathematical judgment based on consolidation of independent voting. Like brainstorming, nominal group technique generates an abundance of ideas before allowing any evaluation and, it may be used at various points in the decision-making process. Unlike brainstorming, its format provides a greater assurance that all group members participate, without early influence by each other's ideas or style. On the other hand, it requires more time, clearer problem definition, and stricter adherence to the process, to be effective (Gillispie, 1987).

Theory X & Y. Theory X & Y rests on assumptions used as guides to action in dealing with employees in the organization. Douglas

McGregor's Theory X states that people dislike work, have little ambition, shun responsibility, want to be directed, desire security most and must be coerced. Theory Y states briefly that work is natural, attitudes depend on experiences, controls and threats do not cause effort, people select and commit to their goals, want rewards, do not shun responsibility, and want to use their creative imaginations to solve organization problems (Owens, 1991).

Benchmarking. Benchmarking is a survey technique conducted to ascertain how an organization compares to other institutions. Internal benchmarking is a form of collaborative improvement that many organizations and managers use to identify best in-house practices and to disseminate the knowledge about those practices to other groups in the organization.

Internal benchmarking is frequently done by larger organizations as the first step in what will eventually become an outward-focused study. There are two primary reasons for this. First, it enables the benchmarking team to climb the learning curve, i.e., develop or enhance its fundamental base of knowledge about the issue being studied, with help from colleagues, who should have fewer reservations about sharing than counterparts at other organizations. Second, it provides the benchmarking team with more to offer to managers in external target organizations when approaching them about cooperating or collaborating in a study (Boxwell, 1994).

Cost-Benefit Analysis. Cost-Benefit Analysis is a systematic means of evaluating the costs and benefits of projects over their life-times. It aims to determine whether or not a particular program is justified, to rank various

program alternatives relative to a given set of objectives, and to ascertain the optimal course of action to attain these objectives (Herbert, 1987).

The cost of an alternative includes direct expenditures and consumption of resources along with the costs of lost opportunities and other less tangible consequences such as loss of morale or political support.

Evaluation of benefits may be more difficult. The concept of benefits is a broad one, covering the direct and immediate gain produced, such as increased achievement, as well as indirect effects to clients of the institution and the general public, such as satisfactions and income increases. Benefit analysis is thus meant to include a comprehensive view of all the positive effects (expressed in dollar terms) that may result from each possibility.

The ratio of costs to benefits provides a simple quantitative way to compare the relative merits of alternatives. The higher ratios indicate the preferred choices.

Forecasting. A forecast is a projection or prediction of future values. Forecasting models seek to explain or describe a cause-and-effect relationship between certain long term growth trends, established operational cycles, observed indications of the state of the operations environment, and freely specified management decisions (all as causes or independent variables) and future benefits of a particular type (the effect or dependent variable). Regression, path analysis, and time series are considered the types of extrapolation methods more commonly applied in education.

Regression analysis is a statistical technique that can be used to develop a mathematical equation showing how the two variables are related.

When the relationships involve two or more independent variables the estimation is called multiple regression analysis (Anderson, et al. 1994).

Linear Programming. Linear Programming (LP) is one of a set of general mathematical modeling techniques that can be used to determine the optimal allocation of resources among competing activities. LP may be used to either maximize or minimize an objective within the limitations of a set of constraints.

Essentially, a programming problem is linear if it calls for optimization of an objective function that is a linear combination of the control variables under a set of constraints in the form of linear inequalities. A linear inequality is simply a mathematical statement to the effect that some linear combination is greater or less than some constant number. An objective function means that each unit of value measured by the function is the direct proportional result of assigning a certain value to a control variable (Kwak & Schniederjans, 1982).

Network Models. Network analysis is a managerial technique which focuses attention on significant program components, highlights potential problems, and monitors progress toward the attainment of program goals. In network analysis each component of the system is viewed in relation to the other parts or activities. The activities are arranged in a sequential order relative to the time required to complete each component. The total system and the relationships among its components can be seen from a schematic model in the form of a flow chart or diagram.

Besides providing a representation of a situation, the network model may be analyzed to yield information about particular properties which

affect management decisions. Many of the more refined network models can be used to generate sets of constraints for a linear programming model, so that optimal schedules can be found, satisfying arbitrary sets of constraints.

Critical Path Method (CPM) is a network method for planning and controlling large, complex projects by identifying the relationships among the component parts and time (Massey, 1979).

Program Evaluation Review Technique (PERT) is an evaluation application used to study more efficient ways of scheduling activities, further planning, and better control (Cornell, 1980).

Significance Testing. Significance testing refers to a group of statistical techniques used to make judgments on whether two sets of data could have been drawn from the same population and on the differences that arise by chance or from data that were drawn from different populations.

If an administrator is considering two sets of data statistically for significance testing, he or she is concerned with samples drawn from two populations. Significance tests are usually applied by comparing the means of the samples or the variances among them (F test), or the fit of the two sample distributions as a whole (chi-square test). If the administrator were to draw two samples at random from the same population, the two samples would exhibit differences, just as they would if they were drawn from different populations.

Significance testing helps to determine whether or not the differences could have arisen by chance, or whether they are attributable to an origin in two distinct populations (Finch, 1985).

Simulation. Simulation is a technique that uses a computerized model to recreate an actual situation and then studies the system's characteristics and behavior by experimenting with the model. The simulation model describes the operations of the system in terms of individual events in the individual components of the system.

Simulations are more appropriate for recurring situations and where data are available, such as operational and financial planning. Constructing simulations in management areas which are not easily quantified, such as hiring and promotion decisions, collective bargaining, choosing new curricula or improving communications in community relations are more difficult to make (Hillier & Lieberman, 1990).

Total Quality Management. Total Quality Management (TQM) is a style of management that offers both a process and a system to produce dynamic change in organizations. TQM is a personal philosophy and an organizational culture that utilizes scientific outcomes measurement, systematic management techniques, and teamwork to achieve the mission of the organization following certain principles for continuum improvement (Sherr & Lozier, 1991).

Control charts are used in TQM to draw a picture or graph of an operation. A graph is a representation of numbers of geometric figures drawn to scale. The use of graphs is important because there are always people who hesitate to read tables, and who gain a better understanding of

materials if the materials are presented in graphic form. Graphs are run charts with statistical limits drawn on either side of the process average. Interpretation of a graph is simple if administrators keep in mind the pattern that is formed by a stable process.

Other control techniques using charts have been developed to deal with conditions that lend themselves to the collection of attribute data.

Flowcharts are one of the most important tools employed in the quest to understand and control processes. They are applicable to virtually all operations in all organizations. The easiest way to see how a process works is to draw a picture of it.

The cause-effect diagram (fishbone) presents an excellent tool for use in the determination of problem causes. The diagram pictorially illustrates the various causes which affect a process or organization by sorting out potential causes and providing a relationship to the problem or effect.

Organization of the Study

This study is divided into five chapters. In the present chapter, the phenomena to be explored and the rationale for the study have been discussed. Chapter II elaborates on a review of literature related to the implementation of techniques, extent of use, and personal and organizational factors in educational settings, that have produced results in past studies. Chapter III describes the methodology employed in gathering data. Chapter IV reports the findings of the study. Finally, Chapter V analyzes the findings, provides interpretations and conclusions related to the research

questions, and discusses the implications of these results for future research and practice.

CHAPTER II

Review of Literature

Over the last 25 years, much work has been devoted to the construction of models to aid administrators in higher education in making better decisions concerning the complex and uncertain problems that they face. Numerous studies have been conducted during this time period for assessing the scope and scale of penetration of these behavioral and quantitative techniques in organizational management and the administrative process.

This chapter provides a background for the design of this research and for the analysis of results. What follows is a review of the past theoretical and empirical research related to this present study. The chapter is divided into three sections. The first section describes relevant approaches applied to organization and administration of institutions of higher education. The second section examines pertinent successful models that are used in diverse areas of educational institutions. The last section discusses the primary empirical research on the extent of the use of various qualitative and quantitative techniques in different kinds of educational organizations.

Approaches to Higher Educational Management

Three of the four prevailing theories of organization and administration of colleges and universities are the well-known bureaucratic, collegial, and political models (Baldrige, Cutis, Ecker, & Riley, 1978).

These three descriptive theories about organizations cited in the literature have employed goal-setting and bureaucratic structure concepts from various perspectives to explain the more critical decision-making processes in educational institutions (Baldrige et al., 1978; Millett, 1978; Mortimer & McConnell, 1978; Taylor, 1983). The degree of consensus among organizational members has been hypothesized in these models to predict the extent to which formal structure enters into the decision-making mechanism.

The prevailing fourth theory, the “garbage can model,” describes the decision-making process in universities as organized anarchy (Cohen & March, 1974; Cohen, March & Olsen, 1972; March & Olsen, 1976). Behavior is seen as non-purposive and often random because the goals are unclear and the means to achieve them complex and problematic.

These four frames of reference have had considerable relevance for understanding colleges and universities as organizations and the ideologies that shape management practice (Morgan, 1986). Clearly, the theoretical and practical research framing these different approaches has focused more on the organization as the unit of analysis and study, than on the individual as the basic element for the decision-making process (Bess, 1988).

Morgan (1989) stated that each frame of reference leads to a different approach to management. Colleges and universities generally apply a pluralist ideology where individuals reflect different interests, aims, and forms of action. Administrators are thus focused on balancing and coordinating the interests of organizational members so that they can work together within the constraints set by the organization’s ambiguous goals

and resources. Administrators recognize the politics of an organization and accept their roles as agents having organizational power, and as arbitrators of conflict management.

Birnbaum (1988) wrote that educational administration is very frustrating because almost always solutions to problems create new problems. One way of attempting to increase administrative capability is to resolve dilemmas by seeking more rational ways of making decisions, more structured methods of problem-solving, or greater authority in overcoming the inertial forces of participants. An alternative approach is to appreciate the cybernetic nature of academic institutions.

Hardy (1982), and Mumford and Pettigrew (1975) pointed out that decision-making is more likely to be political when declining resources intensify competition, or when dramatic shifts in the distribution of resources threaten the power positions of particular groups.

According to Owens (1991), organizational thought took a major turn away from formal theorizing models and toward a markedly increased emphasis on the human dimensions. This shift was fundamentally caused by a combination of several forces that came together simultaneously. The main forces were the intellectual development of leaders and administrators, including faculty, to recognize a new analysis about fundamental corporate concepts of what educational institutions are, and the understanding of the complex human interactions that are maintained in those institutions. Non-bureaucratic approaches to organizing and administering have been rapidly gaining support in recent years.

During the 1990s, many of the qualities of organizational management and administrative changes used in business, such as those that emphasized information, cybernetic development, decentralization, simultaneous loose-tight properties, and productivity through people, have been applied with equal force to educational organizations (Deal & Kennedy, 1982; Naisbitt, 1982; Peters & Waterman, 1982).

Regardless of the theoretical framework accepted by educational administrators, both administration and management involve the coordination of human and material resources toward the effective accomplishment of organizational objectives (Foxley, 1980). In carrying out their managerial functions, administrators can be greatly assisted if they are familiar with modern management techniques. Some of the more common techniques, which have been beneficial in a variety of work settings, were identified in chapter one of this study. Their primary applications to higher education institutions are discussed here.

Models Applied to Educational Institutions:

Qualitative Techniques

Gotowala (1982) employed force-field analysis as an intervention method for improving the organizational climate in schools. This methodology permitted the identification of diverse opinions and causes and factors affecting achievement of goals. Force-field analysis was useful in developing objectives and strategies for achieving goals and monitoring planning processes.

Finley (1984) outlined problem-solving steps and described force-field analysis as a technique useful for diagnosing human resources development and training problems in educational organizations.

Latta and Downey (1994) examined a wide array of sophisticated problem-solving tools and their uses in a humanizing way that involved all stakeholders in the change process. Brainstorming, nominal group technique, and the focus group were three integrative qualitative tools for comprehensive planning and implementation. Statistical charts, Pareto analysis, and benchmarking were quantitative tools that simplified the allocation of functional groups into the stages of planning and control for achieving continuous improvement.

Hawkins (1990) described the implementation of self-management teams in technical services, and discussed case studies of the use of nominal group technique as a team development tool in university librarianships. Assumptions about the politics behind such methods were explored and reported, suggesting that perceived levels of employees' participation were higher particularly when they interacted with students.

Talbot (1992) claimed that the nominal group technique produced higher user satisfaction, was more easily administered, and that its reliability as a new technique for evaluating postsecondary education courses and improving instruction has been confirmed in educational applications.

McLaughlin and Howard (1990) presented a paper at the 1989 Conference of the Professional Association for the Management of Information Technology in Higher Education (also known as CAUSE), on funding and accountability issues. This document included a checklist for

Institutional Information Support that suggested uses by educational institutions of higher education in planning and control of administrative and information systems development.

Cornell, Hinz, Lied, and Spears (1989) provided several standards checklists for evaluating institutional learning resources programs. The self-study evaluation checklists were instruments used to assist learning resources staff in determining whether or not their programs were effective, how they could be improved, and their effectiveness compared to similar university programs. Experience indicates that a good centrally administered Learning Resources Program (LRP) provides the most efficient and effective means of serving other institutional programs.

Franklin (1989) investigated the degree to which managerial philosophy was related to training and development in professionals' acceptance and practice of the adult-learning principles that support the collaborative teaching-learning mode. The variable of managerial philosophy was assessed by five multiple choice managerial questions derived from McGregor's (1960) theoretical framework of Theory X and Y assumptions. The study concluded that the most effective trainers were persons with a Theory Y orientation. The higher the level of education of the trainers, the more collaborative they were with the participants.

Semlak, Cragan, and Cuffe (1986) used a three-dimensional model for understanding corporate culture within a state university and describing the managerial styles of chairpersons. The statements in the questionnaire indicated each of the three types of leadership style: (a) theory X, emphasizing a chain of command approach, (b) theory Y, emphasizing

employee satisfaction, and (c) theory Z, emphasizing participatory decision-making. Results showed that the subjects perceived their management style as flowing from a theory Z culture. However, on two issues, tenure/promotion and quality control of services, the subjects operated from theory X.

Barry (1982), based on a survey and on individual interviews, proposed to merge theory X and Y to produce theory Z. The researcher emphasized that theory X assumptions characterize today's predominant pyramid organizational structure, a structure which is not conducive to the implementation of theory Y assumptions in educational institutions. The mid-point, termed theory Z, resolved certain situational managerial conflicts between theories X and Y. The researcher suggested that moving toward such a structure would help solve some of the problems of teacher alienation today.

Freed, Klugman, and Fife (1994) presented the results of a national survey of institutions, seeking information about adoption of managerial techniques, specific statistical tools used, benefits, and frustrations experienced in 414 institutions of higher education that applied Total Quality Management (TQM). The areas that most frequently adopted the TQM philosophy of management were top-level administration, registration, physical plant, admission, and accounting. The statistical tools most often used were flow charts, cause-and-effect diagrams, and nominal group processes. Improved communication and customer satisfaction were cited by 65 percent of respondents as key benefits of TQM, while perceptions of

TQM as a fad, and a time consuming practice, were cited as major frustrations.

Cope (1981) reviewed techniques required in colleges and universities for the use of strategic management and corporate planning approaches. Five areas of the strategic planning process were the most often identified: (a) the mission, (b) the role and scope of the institution, (c) analyzing the data of internal operation, (d) analyzing the data of the external environment, and (e) matching the institutional mission and strengths to capitalize on opportunities for alternative formulations of policy. Among the most substantial modern roots of the concept of corporate planning were: field theory, geopolitical theory, general system theory, concepts and techniques of marketing, and the concepts of organizational effectiveness.

Bishop (1982), through a survey conducted in 1979, examined the extent to which a selected group of 21 housing officers agreed or disagreed with a list of assumptions published by the National Association of College and University Business Officers (NACUBO). The assumptions were related to the business environment in which college and university administrators operated during the 1980s. The response rate was 100 percent, due to follow up efforts. The results indicated that respondents agreed with all assumptions presented, and emphasized two of them as the most important: (a) develop management tools and automatic data processing techniques current with present technology, and (b) prepare to provide more services at lower cost.

Meabon, Sims, Suddick, and Alley (1976) examined the implementation of modern management techniques in student affairs units in

American postsecondary education. The six management techniques were: use of statements of purpose, goal statements, written objectives, job descriptions, evaluation, and rewards. Differences in the use of the six techniques between two-year and four-year institutions as well as private and public institutions were marked.

Meabon, Suddick, Owens, and Klein (1981) replicated the national study of Meabon, Sims, Suddick, and Alley (1976) on Management Techniques in student affairs. They used the same instrument as the initial 1976 research. As such, the Management by Objectives cycle presented by Lahti (1973) served as the point of departure for the development of the earlier survey instrument. Responses indicated that although management techniques of four-year colleges and universities had remained unchanged, applications of the techniques varied between two-and four-year colleges and universities.

In *Experience of Organizational Behavior*, Morris and Sashking (1986) explained how academicians and practitioners, in particular, can use behavioral techniques for helping people to solve problems in groups and organizations. Their major goal was to help the user learn through guided experience the skills and procedures that are needed to be an effective helper or agent of change. Integration of skills through simulated organizational behavior are demonstrated and practiced through multiple exercises.

Quantitative Techniques

From a historical perspective, it is interesting to note several early papers calling for the application of systems analysis and quantitative methods to education. Early papers were written by Platt (1962), and Schroeder and Rath (1965). Although these papers and others called for applications of quantitative techniques, little was accomplished until after 1970, when applications and research began to expand rapidly.

Earliest efforts to standardize and make explicit a quantitative language for higher education administrators focused on ways of describing particular categories of resources. Standardized definitions, categories, and data collection procedures were developed for facilities by Dahnke, Jones, Mason, and Romney (1971), and Romney (1972). Minter (1972), and Jones and Drews (1977) developed models for application to personnel functions. The results of these works, carried out by the National Center for Higher Education Management Systems (NCHEMS), under contract to the National Center for Education Statistics (NCES), were incorporated in the Higher Education General Information Survey (HEGIS) conducted by NCES (Lawrence & Allan, 1977).

The transformation of data into information, also called information analysis, was supported by management information system processes. “It helped to make an immediate distinction between data and information and was a determinant in administrators’ understanding of the quantitative approach in a specific decision-making context” (Balderston, 1974, p. 230).

Many operational problems in higher education institutions, such as those found in resource allocation, financial planning, student registration,

goals, evaluation, rewards, logistics, and sound problem-solving and decision-making have been based on research that dealt with the application of models or quantitative techniques.

Eppen, Gould, and Schmidt (1991) pointed out that there are fundamentally four reasons why quantitative techniques are used by managers. They are:

1. Models force managers to be explicit about objectives.
2. Models force managers to identify and record the types of decisions (decision variables) that influence objectives.
3. Models force managers to identify and record pertinent interactions and trade-off between decision variables.
4. Models force managers to record constraints (limitations) on the values that the variables may assume. (p. 18)

In quantitative decision-making problems, different kinds of formal mathematical and other types of models have been implemented. Anderson and Chung-ting (1981) developed a mathematical model through linear programming to determine how offers of financial aid should be allocated to graduate student candidates to maximize enrollment. It was shown that offers may exceed funds available, because not all offers will be accepted.

Gray (1980) developed a faculty model for policy planning. The approach, using a computer-based model, permits the prediction of probabilities of death, resignation, and other faculty variables to develop scenarios for future years under different policies. Each faculty member

was tracked separately, beginning from the person's current status. The model has been implemented in many universities in the country.

Hopkins (1980) presented two models that have been frequently used in institutions of higher education. A network model sets affirmative action goals and evaluates its progress toward attainment of those goals. The other model, using a Markov or chain process, has been used to predict staff attrition and to estimate the number of university positions that can be occupied by women and minorities.

Pope and Evans (1985) developed a decision support system through simulation that can be used to forecast freshman enrollments based on data at various points in the admission process. It also can be used to simulate the effects of various policies on university enrollments.

Sinuany (1984) implemented a network approach for allocating budget dollars among a multi-campus system over a period of five years. He combined a network model with simulation to generate cost predictions for each campus.

O'Neill (1984), in presenting definition and models of management science, described how operational research tools can be applied to library and information services.

Peschel (1988) proposed a model for evaluating professional information to be required by educational institutions. The author designed four categories of information for those who currently seek or will seek to be employed in the future. The four categories were: personal characteristics; knowledge learned as an undergraduate; knowledge learned in graduate

schools such as the computer, or library science; and knowledge learned on the job and in continuing education.

Empirical Research on Extent of Use

After considering some of the qualitative and quantitative models implemented in educational institutions, it is natural to ask about the extent of the consequences of the use of such approaches. Some research in this area has been conducted. While much has been written about management science applications (quantitative techniques), relatively little has been written about the extent of the use of behavioral (qualitative) techniques.

It is evident that behavioral tools, because of their “artistic” nature, require administrative ability and considerable creativity for successful applications (Ackoff, 1978). What is relatively new in the literature is the growing recognition that qualitative approaches are becoming widespread and diverse, and that evaluations of the use and impacts of such approaches are becoming more prevalent.

In general, attempts to evaluate qualitative management techniques in the context of higher education have met with many of the same difficulties that arise in efforts to evaluate quantitative techniques. Emphasis has tended to be on the measurable rather than on the impacts--the benefits and obstacles--that accrue as a result of their use. However, by assembling what is known about the use of diverse quantitative techniques, and by weighing the findings, it is possible to arrive at some tentative evidence that

the use of these approaches can be expected to continue to expand in the foreseeable future.

Because studies have dealt with techniques as they are used, the literature reports a vast amount of research made on eight selected quantitative techniques that are applied to different organizational areas in diverse institutions. These techniques are: simulation, queuing theory, statistical inference, regression analysis, inventory models, mathematical programming, decision theory, and network in planning evaluation review technique/critical path method (Ciecka, Comer & daSilva, 1973; Coppinger & Epley, 1972; Gaither, 1975; Green, Newson, & Jones, 1977; Kiani-Aslani, 1977; Klammer, 1972; Petty & Bowlin, 1976; Schroeder, 1973; Turbin, 1972). The samples, methodologies, and findings of these studies were different. However, the study by Klammer (1972), who examined the aspect of technique usage, clearly indicated an increase in the adoption of quantitative techniques over time during the 1970s.

Morgan (1989) presented the results of a survey about the comparison of 15 studies of quantitative techniques in diverse organizations. Although other additional techniques to the eight mentioned above were included in these comparative surveys, the researcher reported evidence that large firms showed increasing use of quantitative techniques. However, during the 80s, survey response rates declined. The researcher suggested that further research is needed in order to study differences in quantitative techniques according to firm size and industry classification. Identifying what types of techniques small firms and service organizations use and find

most useful would help target the educational needs of groups such as academicians and practitioners.

White (1987) analyzed 146 articles, including surveys, about management science models that had been developed and implemented for higher education administration. The results, according to the researcher, were both surprising and informative. Although the largest number of models have been developed for use at the presidential or vice presidential level of institutions, the highest percentage of successful implementation occurred at the departmental administration level. There have been very few implementations at the state or federal levels. While scheduling was the one purpose for which the fewest number of models were developed, those models also had the highest rate of implementation. The most commonly used technique was mathematical programming, but it also had an extremely low percentage of ongoing implementation. The results indicate areas that need further work in determining how management science models could be used, and for which decision-making situations those models would be appropriate. Decision support systems and management information systems, though still small in number, appear to be offering attractive options for administrators who may have been unwilling to use other techniques that allow for less involvement on the part of the administrator.

CHAPTER III

The Methodology of the Study

This chapter addresses the research methodology used in this study, including the research questions, the hierarchical framework used for identifying the administrators to be surveyed at the selected institutions, the population and sampling of the study, the research variables and the proposed model of their relationships, the survey instrument, the pilot study, the data collection procedures, and the statistical techniques for data analysis.

Research Questions

The study's research questions enumerated in chapter one are reproduced below. These questions constitute the focal points of this empirical study.

1. What kind of managerial methodologies, among qualitative or quantitative techniques, are more familiar to administrators for use in their decision-making processes and tasks?
2. To what extent are administrators using selected qualitative and quantitative techniques in carrying out their managerial functions of planning, directing, reporting and controlling?
3. At what functional level of services--nonacademic and academic--do managers possess the highest degree of familiarity or expertise in using qualitative and quantitative techniques?

4. Do administrators differ in the extent of their use of the management techniques by category type (nonacademic and academic), and by functional levels (executives and operatives)?

5. What type of benefits do administrators perceive from using qualitative and quantitative techniques in their decision-making processes?

6. What kind of constraints do administrators commonly encounter in implementing qualitative and quantitative techniques in decision-making at colleges and universities?

7. Have the administrators received institutional training in the selected techniques to enhance their decision-making processes?

8. How are selected administrators' personal and institutional characteristics associated with the utilization of selected qualitative and quantitative techniques? Personal characteristics include: (a) education, (b) experience, (c) managerial skills, and (d) decision-making styles. Organizational characteristics include: (a) training and (b) extent of computerization.

Specifically, an examination of these variables will be conducted and the relationship among them will be discussed by using the following subset of questions:

a. Have the administrators an adequate level of education that supports the extent of use of behavioral and quantitative techniques at their institutions?

b. Have the administrators adequate years of service or experience associated with the extent of usage of behavioral and quantitative techniques?

c. Are the administrators applying rational decision-making methods (conceptual and interpersonal skills) for analyzing relevant problems at the departmental unit in their organizations?

d. What style of decision-making is more frequently perceived as being applied in their institutions or departmental units?

e. Are the administrators using software packages and computer instruments for analyzing data or solving problems in their departmental units?

Hierarchical Framework

The research methodology of this study involved the use of a mailed questionnaire to gather the essential data. The instrument was sent to different nonacademic and academic administrators in executive and operative levels, previously identified as operating in these two functional areas.

The Higher Education Directory 1996 was used to identify all Virginia colleges and universities granting at least a four-year baccalaureate degree and having a total enrollment of at least 1,000 students.

As the formal organizational structure of the institutions differs both between and within colleges and universities in their own modes of organization, the classical frame of reference for the three levels of authority that classifies managers in strategic, tactical, and operative levels (Anthony, 1979) was modified to two levels. The top management and executive positions were considered as strategic and tactical levels, and the operative level was considered as the lowest management level occupied by

operative directors who are engaged in accomplishing strategic and tactical actions.

Within a campus, the strategic level of authority is represented by the chief administrative officer, who is usually designated as president at the highest hierarchical level. At this level, there also are tactical executives such as vice-presidents, chancellors, provosts, and deans, usually having separate administrative, academic, and operational responsibilities and activities (White, 1987).

The operative level of authority is composed of the academic and administrative personnel, who are usually divided into departments and service units, each one of them administered by a chairperson, director, leader, or manager.

The functional subsystems were categorized by the degree of internal differentiation in terms of their specialized division of labor and operative interests. These were: (a) nonacademic, and, (b) academic subsystems. Each one includes several officials selected by general or specific objectives, authority, and functional interactions. The different interactions include: (a) central management, (b) general administration, (c) academic administration, (d) student administration, (e) general services, and (f) shared functions (Telem, 1981). Table 1 shows the final functional administrative/academic approach used in this study to identify nonacademic and academic positions and responsibilities.

Table 1
Nonacademic/Academic Category and Executive/Operative Functional Levels

Administrators by Category and Levels
<p>NONACADEMIC</p> <p>EXECUTIVE</p> <p>Presidents</p> <p>Vice-presidents for Business and Finance</p> <p>Vice-presidents for Student Affairs</p> <p>Vice-presidents for Development</p> <p>Vice-presidents for Planning & Research</p> <p>OPERATIVE</p> <p>Directors of Administrative Services</p> <p>Directors of Student Services</p> <p>Directors of Institutional Research</p> <p>Directors of Admissions</p> <p>Directors of Athletics</p> <p>Registrars</p>
<p>ACADEMIC</p> <p>EXECUTIVE</p> <p>Provosts</p> <p>Vice-Presidents for Academic Affairs</p> <p>Deans</p> <p>Associate Deans</p> <p>OPERATIVE</p> <p>Department Chairs</p> <p>Directors of Libraries</p> <p>Directors of Academic Affairs</p>

Population and Sampling

According to the Higher Education Directory 1996, there were 63 campuses operating in the state of Virginia, distributed among 21 colleges, 18 universities, 23 community colleges, and the Virginia Military Institute.

Only institutions of higher education granting at least a four-year baccalaureate degree and having a total enrollment of at least 1,000 students were included in this study. Therefore, the target population was limited to 14 colleges and 19 universities. Table 2 presents detailed figures concerning the institutions, based on their size and type of control.

In order to ensure adequate representation, a stratified random sampling process was used. As the primary concern of the present study was to survey differences among various functional subsystems of administrators working in two different settings, colleges and universities, the basis for stratification was the institutional setting involving the functional subsystem of operations. Accordingly, samples of equal size from each institutional category, 6 colleges and 6 universities, was identified as an appropriate sampling. "In stratified sampling one first identifies the strata of interest and then randomly draws a specified number of subjects from each stratum" (Ary, Jacobs, & Razavieh, 1990, p. 174). In this type of survey, done through a mailed questionnaire, taking equal numbers of organizations from each institutional category was an effective procedure to use in analyzing the various opinions of administrators in each institution. It was assumed that having a sample of 12 institutions was sufficient for the purposes of this study.

Table 2
Virginia Four-Year Colleges and Universities Headcount Enrollment, 1996

Institutions	Student Enrollment
PUBLIC	
Clinch Valley College of the University of Virginia	1,729
Christopher Newport University	4,850
College of William and Mary	7,766
George Mason University	20,829
James Madison University	11,343
Longwood College	3,287
Mary Washington College	3,696
Norfolk State University	8,624
Old Dominion University	16,508
Radford University	9,430
University of Virginia	18,016
Virginia Commonwealth University	21,939
Virginia Military Institute	1,265
Virginia Polytechnic Institute and State University	26,003
Virginia State University	4,589
PRIVATE	
Averett College	1,794
Eastern Mennonite College and Seminary	1,068
Ferrum College	1,913
Hampton University	5,582
Hampden-Sydney College	1,076
Hollins College	1,029
Lynchburg College	2,379
Liberty University	8,589
Mary Baldwin College	1,256
Marymount University	3,817
Randolph-Macon College	1,118
Roanoke College	1,677
Regent University	1,313
Shenandoah University	1,467
University of Richmond	4,678
Virginia Union University	1,511
Virginia Wesleyan College	1,515
Washington and Lee University	1,965

It was assumed that not all of the respondents would return the questionnaires. Therefore, a sample of 12 institutions was selected and follow up efforts were initiated to obtain a meaningful rate of response.

Research Variables

Another purpose of this study was to answer questions about personal and organizational factors related to the propensity of administrators to adopt certain qualitative and quantitative techniques for decision-making and administrative tasks.

The role of personal variables, such as level of education, experience, degree of familiarity with techniques, managerial skills, and decision-making styles emerged from the results revealed in the literature review in chapter two (Al-Kazemi, 1992; Bostrom, Olfman, & Sein, 1990; Eilon, 1977; Hellriegel & Slocum, 1992; Katz, 1974; McArthur, 1980; Roger, 1983; Zmud, 1979). Several researchers have noted that certain organizational factors such as level of authority, and the extent of computerization and training facilitate and affect administrator behavior and adoption of innovation in organizations (Black & Gilson, 1988; Gould, 1983; Sanders & Courtney, 1985; Stevens & Laplante, 1986; Swiss, 1991). Innovation is defined as the generation, acceptance, and implementation of new processes, ideas, or services into a sustained recognizable behavior pattern within an organization setting (Pierce & Delbecq, 1977).

Independent Variables

“Education” refers to the level of specialized or formal preparation obtained through a process of schooling or program of instruction that an administrator has achieved. This variable of education was measured through one question about the highest academic degree obtained by administrators in their professional field of study, ranging from bachelor to doctoral studies. Any professional programs completed by respondents with characteristics different from classical educational academic structures were designated as an “other” category of education.

It is widely believed that the level of education achieved affects human behavior in adopting innovations. For instance, Rogers (1983) noted that those people who are likely to be early in adopting innovations have had more years of education than those who are reluctant to adopt innovation. Eilon (1977) suggested that a quantitative oriented person should possess the necessary knowledge to confront intangibles and would be willing to use non-numerical methods in dealing with problems. In the same vein, using the basic theory of individual development, McLaughlin, Montgomery, and Malpass (1975) proposed that the orientation of department chairs be directed toward three relevant areas: familiarizing the chairs with the rules, regulations, policies, techniques and the big picture at their universities; orienting academic administrators to the administrative activities expected of them, such as developing and living with a budget, managing the physical plant and equipment, assigning work responsibilities, and related duties; and orienting chairpersons to leadership activities expected of them, such as

proficiency in small group leadership and discussion techniques. This suggests the importance that managerial education plays in academic institutions and reinforces the beliefs that the level of education may affect human behavior in adopting innovative process and practices.

“Experience” refers to the time spent working in a specific position, or to the time period spent as an academic, or as a nonacademic officer at one institution. This variable was measured using the number of years spent in the respondent’s current position.

Zmud (1979), and Bostrom, Olfman, and Sein (1990) suggested that work experience is an important factor to be considered in the design and utilization of information technology in organizations. Al-Kazemi (1992) found that individuals in public administration with more work experience use quantitative techniques less frequently. Contrary to that finding, in this research, given the fine selectivity and level of competence required by administration in higher education, it is expected that administrators with more work experience in such positions are likely to have more knowledge and capabilities for applying managerial techniques than others with less experience.

Managerial skills are abilities related to the administrator’s performance that are learned and not necessarily “inborn”. The literature has revealed several attributes, such as technical skills, conceptual skills, interpersonal skills, that are particularly relevant to the effective use of qualitative and quantitative methods (Hellriegel & Slocum, 1992; McArthur, 1980).

For purpose of this research, conceptual skills involve viewing the organization as a whole and applying one's planning and thinking abilities (Hellriegel & Slocum, 1992). Such skills are particularly important to the administrator's rational decision-making process. Four descriptors referenced in a Likert four-point scale from 1 (strongly disagree) to 4 (strongly agree) facilitated the identification of the level of the attributes "a" to "f" describing a rational decision-making process on question three in the questionnaire, part II.

Interpersonal skills include the abilities to lead, motivate, manage conflict, and work with others. Interpersonal skills focus on working with people (Hellriegel & Slocum, 1992). Because every institution's most valuable resource is its people, interpersonal skills are a part of every administrator's job, regardless of the level of authority or the functional area. Administrators with good interpersonal skills like to work with people. In this sense, in this study, interpersonal skills were related to three decision-making actions or activities identified as points "g, h, i," and integrated in question three, part II of the questionnaire. A Likert four-point scale from 1 (strongly disagree) to 4 (strongly agree), related to the administrators' decision-making process in their work involving subordinates' mutual interests was used to measure such attributes.

Decision-making styles refer to the habitual processes that administrators exhibit in acquiring, analyzing, and interpreting data (Brightman, Elrod, & Ramakrishna, 1988). In this section, perception of the different managerial types of decision-making was measured by question six

in the questionnaire, part II. This question identified the managerial styles believed to be used in each respondents' organization or departmental unit.

The extent of computerization refers to the prevalence of the use of hardware and software systems by administrators to produce tangible and intangible services in organizations on a regular basis. A well-designed computerized information system can generate essential data inputs and processes to make more timely decisions and improve administrators' decision-making and control. By developing their computer skills and judiciously selecting the right software, administrators are able to access the exact information they want, literally in seconds (Robbins & DeCenzo, 1995). In this study, the variable extent of computer usage in the decision-making process was measured with a Likert four-point scale, by question seven, from 1 (not used) to 4 (extensively used) meaning that all decisions at the departmental level are integrated with the computer system.

Similarly, question eight of the questionnaire explored the use of particular software packages or specific computer programs in each department.

Training refers to the process of continuous learning in qualitative and quantitative techniques for decision-making. This variable was identified in question nine, part two of the questionnaire, as a checklist that asked for a simple "yes-no" regarding to institutional support of training.

Eight derived benefits and nine presumed constraints were indicated in question four and question five of the questionnaire. These benefits and obstacles encountered in applying qualitative and quantitative techniques in the organizational and departmental environment were integrated in order to

explore the real or potential benefits and obstacles derived with the use of the management techniques during the administrators' work.

The Dependent Variables

The dependent variables are the degree of familiarity with the techniques and the extent of use of the selected qualitative and quantitative managerial techniques.

The degree of familiarity with the techniques refers to the administrators' expertise with each of the listed techniques. This variable was measured on a scale from 1 (not familiar) to 4 (very familiar). A grand mean across techniques was used to measure differences among administrators' category and levels.

The extent of use refers to the frequency of use of the qualitative and quantitative techniques in the decision-making of institutional management from both nonacademic and academic category and functional levels. The operationalized scale was from "1" representing "never use," to "4" representing "always use." The highest rank ordering in terms of mean score was used to measure the level of application. Moreover, a grand mean finding across the management techniques, from the descriptors representing the planning, directing, reporting, and controlling dimensions, was analyzed by factorial analysis of variance in identifying statistical significance both within and among the categories and levels with respect to the extent of application.

The Survey Instrument

The questionnaire used for data collection in this study is presented in Appendix A. It consists of various matrix tables and diverse items arranged independently in order to address the research questions and the relationships depicted in this study. The questionnaire items are arranged in three primary sections: (a) information related to the familiarity and application of qualitative and quantitative techniques, (b) information related to the decision-making process, and benefits and obstacles encountered with the use of those techniques, and (c) general background information.

The instrument consists of fifteen items. Research tradition emphasizes the use of previously validated instruments whenever applicable, in order to contribute to cumulative research findings. Accordingly, based upon a review of the literature, several items have been designed and others adapted in developing the questionnaire used in this study. Some questions are presented in matrix tables and multiple scales, and other questions are displayed as self-explanatory inquiries. However, only the first five items presented on Likert-type scales were subjected to reliability analysis.

Part I of the questionnaire included two questions. Question one was designed as a matrix to gather multiple responses related to the variable familiarity or administrator expertise with the techniques. In each row, the selected qualitative and quantitative techniques were grouped. The columns were four descriptors or options: (1) Not familiar, (2) Vaguely familiar (no expertise), (3) Somewhat familiar (limited expertise), and (4) Very familiar

(expert in its use). The reliability coefficient Alpha for this scale taking into account seven qualitative techniques and seven quantitative techniques was .985.

Question two was organized in a matrix table to gather data related to the extent of use of the selected qualitative and quantitative techniques in the functional activities of planning, directing, reporting, and controlling. The columns were labeled in four scales that identify four descriptors or options: (1) Never use, (2) Occasionally use, (3) Frequently use, and (4) Always use. The reliability coefficient Alpha for this scale was .981.

Part II of the questionnaire contains seven questions used to gain information related to the decision-making process. The first three questions of this section are in matrix tables, and the following four questions are separate from the matrix. The aim of this section was to tie techniques with actions in order to measure administrators' abilities and skills, techniques' benefits and obstacles, extent of computerized use, and institutional training received.

Question number three of Part II contains 9 inquiries focused on the cognate information used to analyze administrators' abilities, skills, and the rational decision-making processes. This question (a through f) was adapted from Hellriegel and Slocum (1992) and facilitated the evaluation of information related to a rational decision-making process. Similarly, other items of this question (g through i) helped to evaluate interpersonal managerial skills. A four-point Likert-type scale from one (strongly disagree) to four (strongly agree) was used. The reliability coefficient Alpha for these nine statements of the scale was .965.

Items in questions four and five, which concern benefits and obstacles encountered in using qualitative and quantitative techniques, were adapted from Al-Kazemi (1993). However, various statements were removed and others aggregated for this study. It should be noted that in the pilot study questionnaire, question four, related to benefits expected using the qualitative and quantitative techniques, was evaluated under a scale format based on four points: (1) not likely, (2) somewhat likely, (3) likely, and (4) very likely. The reliability coefficient Alpha for this scale was 0.71. Similarly, question five, related to obstacles encountered in using qualitative and quantitative techniques, was evaluated using a scale format based on four points: (1) never encounter, (2) sometimes encounter, (3) frequently encounter, and (4) always encounter. The reliability coefficient Alpha for this scale was 0.73.

A review of the reliability results of both the fourth and fifth questions of the questionnaire revealed that although they addressed the issue of perceived benefits and expected obstacles encountered with the use of the qualitative and quantitative techniques, their reliability values reflected lack of support, and had a low correlation with the overall scale score. Then, in order to make the questionnaire simple and to improve the reliability of the study a decision was made not to use scale format in these two questions for evaluating each of the given benefits and obstacles. Rather, respondents were instructed to check positively (yes), or negatively (no), if each of the given benefits and obstacles was experienced at their department or organizational unit.

Question six concerns three different methods of decision-making experienced at the institutional or departmental unit. Question seven asks about the extent of computerization in the administrator's work environment. The extent of computer usage in the decision-making process is measured on a four-point scale, with "1" representing not used, and "4" representing extensively used.

Question eight surveys the application of relevant software packages for analyzing data or solving departmental problems, and question nine deals with the type of training received about the techniques at the institutional level. Both questions are formatted as checklists that ask for a simple "yes-no" judgment.

Part III of the questionnaire was designed to gather individual and institutional data on the orientation of the results of variables such as: (1) status or level of functional authority, (2) respondents' experience, (3) level of education, and (4) respondents' field of study.

The Pre-tested Questionnaire

The questionnaire pre-test proceeded in the following manner. Consultations were made during the instrument development to obtain feedback on the quality of the instrument and to identify any needed revisions. During this stage, investigators of institutional research and planning (Dr. G. McLaughlin, Dr. J. Muffo), experts in survey research (Dr. A. E. Bayer, Dr. T. Dinguss), and qualified practitioners (Executive Vice President, Controller, University Leadership Development) and authors of management studies at Virginia Tech (Dr. J. M. Shepard, Dr. R. Taylor)

were consulted to help improve the quality of the questionnaire. Copies of the revised questionnaire also were sent to a small random sample of potential key administrator informants at Virginia Tech to check the quality of the instrument, and to pinpoint any potential problems. Different viewpoints were helpful in improving the instrument as a whole, and in clarifying the individual and organizational variables. Using the guidance provided by Dr. McLaughlin the following issues were examined:

1. Meaning: Whether the questions were understood, and their meanings shared by the key informants. If not, the key informants might modify the questions in order to facilitate their answers, or transform obscure questions into more comprehensible ones.

2. Question difficulty: Whether the key informants were able to answer the questions. Because retrospective questions presented recall problems, care was taken to ensure low question difficulty.

3. The order of the questions.

4. Skip pattern: Clarity of the instructions.

5. Timing: Respondents' interest and overall attention, length, new content, and task variety.

Copies of the letter forms used for pre-testing analysis, pilot study, the survey, and follow-up of this study are presented in Appendix B.

Pilot Study

As noted above, independent questions and related questions were formatted in different approaches and multiple-items scales. Then, a reliability analysis was conducted for both the pilot and final study to test and eliminate ambiguous or biased items and to improve the format, both for ease of understanding and facility in analyzing results (Issac & Michael, 1981).

On the other hand, it was predicted that differences in knowledge, degree of authority, managerial style, level of professionalism, and experience of the administrators related to the diverse managerial techniques might possibly be limiting factors in completing the data. To avoid this type of problem, a set of definitions about the techniques studied was attached to the questionnaire to be used as a guide by the respondents.

Reliability, as Rubin and Babbie (1989) stated, concerns the amount of random error in a measure and measurement consistency. It refers to the likelihood that a given measurement produced will yield the same description of a given phenomenon if that measurement is repeated.

The pilot study was conducted during the month of July, 1996. One institution (Radford University) was selected randomly from those institutions that were not included in the main sample of this study. The pilot study consisted of mailing the survey package to 24 selected administrators of that institution and explaining the purpose of their participation as part of a pilot study. They were asked to provide feedback freely about the clarity and comprehensibility of the survey, and to make any changes and comments on the instrument in general. In addition to the

questionnaire and cover letter, the mailing included a stamped self-addressed return envelope and brief definitions of each technique included in the questionnaire.

A total of 13 questionnaires were returned (54.16 % response rate). In reviewing the results of the pilot study, it was determined that some minor changes were needed. Suggestions made by respondents and the dissertation committee were incorporated into the final questionnaire.

The pilot study showed that three of the main five multiple-items scales included in the questionnaire had acceptable reliability. Accordingly, the reliability of these scales was checked through item-analysis and Cronbach's reliability coefficient Alpha, measuring the internal consistency of the scale. For each scale, item-total score correlations were computed (Barker, 1986). Three of the multiple questions revealed positive correlations with every other item and with the total score of the respective scale. Cronbach's Alpha was .917 for question number one related to the degree of familiarity or expertise. However, by analyzing the correlation matrix for this scale, high variance and multicollinearity was observed in items three and thirteen. A decision was made to eliminate these items of the questionnaire, and the reliability coefficient Alpha changed to .904.

Question number two, related to the extent of use of qualitative and quantitative techniques in the planning, directing, reporting, and controlling functions or activities, presented a reliability coefficient of .930. However, as all items in this question were similar to question one, and because it was already decided to eliminate items number three and thirteen of the

questionnaire, a new reliability coefficient was calculated for maintaining consistency in the scale analysis, which was dropped to .913.

Question number three, that groups nine statements related to managerial skills and rational decision-making processes, presented a reliability coefficient Alpha of .802. This scale was slightly improved by rejecting the descriptor identified as “uncertain,” in order to maintain uniformity with the other multiple scale questions in the questionnaire.

Items in questions four and five, which concern benefits and obstacles encountered in using qualitative and quantitative techniques, presented low reliability. A review of the total variance for both the fifth and sixth items revealed that although they addressed the issue of perceived benefits and expected obstacles encountered with the use of qualitative and quantitative techniques, their reliability values reflected a lack of consistency that had a low correlation with the overall scale score. Consequently, in order to simplify the questionnaire and to improve the reliability of the study a decision was made not to use a scale format in these two questions in evaluating each of the given benefits and obstacles. Rather, these questions were modified, and respondents were instructed to check if each of the given benefits and obstacles were experienced.

In general, in the pilot study and final questionnaire the criteria of a reliable scale were met. Appendix C provides the correlation coefficients for the three primary questions of the instrument used in this study.

Data Collection

Survey research is particularly well suited for studying attitudes, opinions, and orientations in a large population. According to Moore (1983) a high response rate increases the probability that the respondents will accurately represent the sample, thereby reducing the chance of response bias. Questionnaire-type studies frequently fall victim to bias.

As this survey was an exploratory study, strict standards for determining an acceptable response rate were not established. However, in order to looking for the best results, an combined and active follow-up strategy by mail and phone reinforced data collection for running away bias influence exerted by those subjects who did not return the questionnaire.

Statistical Techniques

Data were analyzed using two different procedures: (a) applying descriptive statistics, and (b) using multivariable statistical analysis.

Descriptive statistical analysis included the computing of means and percentages of data related to degree of familiarity with the management techniques, and the extent of use of qualitative and quantitative techniques.

A factorial analysis of variance was used to examine the combinations of the management techniques by different levels of the independent variables. In this study, for analyzing the first three questions of the questionnaire, each subject was exposed to one level of each of independent variables or factors simultaneously (category of subject, and functional level). The factorial design, through the General Linear Model,

allowed greater generalizability of the results and facilitated interpretation of the differences among the unbalanced groups of respondents.

The general linear model used for the three way anova design of the components was the following (Howell, 1992, p. 417):

$$ijkl = \mu + i + j + k + ij + ik + jk + ijk + ijkl$$

In this model the principal effects can be symbolized by i , j , and k . The two-variable interactions are ij , ik , and jk , which refer to the interaction of variables A (management technique) and B (class of administrator); A (management technique) and C (functional level); and B (class of administrator) and C (functional level) respectively. The term ijk refers to the joint effect of all three variables.

It should also be noted that problems of interaction were not studied. Similarly, multicollinearity were tested in the reliability analysis of the pilot study. One common test to detect problems of multicollinearity was the correlation of independent variables at .80 or more. The Statistical Package MINITAB was used for data analysis.

CHAPTER IV

FINDINGS AND DISCUSSIONS

The following chapter reports the results of this study, and evaluates them according to the stated objectives and research questions. The data analysis is comprised of three sections. The first section presents frequency numbers and percentages of the respondents' institutional and demographic information. The second section presents the results taken from statistical analysis of primary research questions. The third and final section presents a brief summary of the findings.

Respondents' Institutional and Demographic Information

Institutional Characteristics

As discussed in detail in chapter three, the questionnaires were sent to 288 nonacademic and academic officers of twelve randomly selected four-year institutions of higher education in Virginia. A total of 160 timely and usable questionnaires were returned between September 20 and November 1, 1996. The overall response rate was 55.5 percent of the sample. The highest response rate was from public institutions, represented by 85 individuals from a sample of 288 (29 percent), versus private institutions represented by 75 individuals out of 288, or 26 percent of the sample.

James Madison University, a public institution, had the highest response rate, with a response level of 18 from 24 surveys sent, or 75 percent. The lowest response rate came from private institutions: Ferrum College with 10 surveys returned from 24 surveys sent, or 41.6 percent, and Marymount University also with 10 surveys returned from 24 surveys

sent. The response rate was slightly higher from public institutions than from private institutions.

Although there have been no similar studies done concerning educational institutions at the state level, when compared to other previous institutional surveys discussed in chapter 2 (Gaither, 1975; Klammer, 1972; Morgan, 1989), this response distribution reflects a usual response pattern for studies of this type.

Table 3 outlines the public and private organizations randomly selected for this study, the total number of institutional surveys sent to them, and their response rate of return.

Nonacademic and Academic Positions

The selected administrators were classified by their position type in either nonacademic and academic categories. Nonacademic administrators selected were those in charge of planning, organizing, coordinating, controlling, and managing all the administrative functions of one department, unit, or several units at the institutional level. Academic administrators, on the other hand, were individuals in charge of planning, organizing, coordinating, controlling, and managing of all the academic parts of one departmental unit, college, school, or institution. Moreover, the strategic and tactical position levels were considered as top management or “executive” positions, and those at the lowest level were considered as “operative” positions, performed

Table 3
Number and Percentage of Responses of Public and Private Virginia Four-Year Colleges and Universities Surveyed

Colleges and Universities	Surveys Sent	Responses Number	Responses Percentage
PUBLIC INSTITUTIONS			
Christopher Newport University	24	13	54.1
College of William and Mary	24	13	54.1
James Madison University	24	18	75.0
Mary Washington College	24	16	66.7
University of Virginia	24	12	50.0
Virginia Commonwealth University	24	13	54.1
Sub-total Public	144	85	59.0
PRIVATE INSTITUTIONS			
Ferrum College	24	10	41.6
Lynchburg College	24	14	58.3
Marymount University	24	10	41.6
Roanoke College	24	14	58.3
University of Richmond	24	16	66.7
Virginia Wesleyan College	24	11	45.8
Sub-total Private	144	75	52.0
TOTAL	288	160	55.5

specially by directors and managers engaged in accomplishing strategic and tactical decisions.

Table 4 identifies the total population, the sample, and the responding distribution of individuals by category of administrator (nonacademic and academic), and position level (executive and operative) surveyed.

The population was determined from the Higher Education Directory 1996. A total of 1,358 individuals were identified as administrators of 14 four-year colleges and 19 universities.

The sample, comprised of 288 individuals, was classified in four different groups by category and functional levels: (a) nonacademic executive group, (b) academic executive group, (c) nonacademic operative group, and (d) academic operative group.

The nonacademic executive sample was represented by 48 individuals from a population of 133 administrators, or 36.0 percent. The amount of responses from this group, in relation to the sample, were 30 of 48 or 62.5 percent.

The nonacademic operative sample was represented by 140 individuals from a population of 624 administrators, or 22.4 percent. The amount of responses from this group in relation to the sample were 72 of 140, or 51.4 percent.

The academic executive sample was represented by 55 individuals from a population of 246, or 22.3 percent. The amount of responses from

Table 4
Number and Percentage of Population, Sample, and Responses by
Nonacademic/Academic Categories and Executive/Operative Levels

Respondent Position	Population*	Sample		Responses	
	Number	Number	%**	Number	%***
NONACADEMIC EXECUTIVE					
Presidents	33	12	36.3	02	16.6
Vice-Presidents for Business Affairs	26	12	46.1	09	75.0
Vice-Presidents for Development	20	10	50.0	07	70.0
Vice-Presidents for Student Affairs	30	08	26.6	06	75.0
Vice-Presidents for Planning & Res.	24	06	25.0	06	100.0
Total	133	48	36.0	30	62.5
NONACADEMIC OPERATIVE					
Directors of Administrative Services	297	60	20.2	34	56.6
Directors of Student Services	231	52	22.5	23	44.2
Directors of Institutional Research	30	10	33.3	05	50.0
Registrars	33	10	30.3	06	60.0
Directors of Athletics	33	08	24.2	04	50.0
Total	624	140	22.4	72	51.4
ACADEMIC EXECUTIVE					
Provosts and VP for Acad. Affairs	28	12	42.8	11	91.6
Deans	162	29	17.9	13	44.8
Associate Deans	56	14	25.0	06	42.8
Total	246	55	22.3	30	54.5
ACADEMIC OPERATIVE					
Departments Chairs	302	26	8.6	16	61.5
Directors of Libraries	33	12	36.3	08	66.6
Directors of Academic Affairs	20	07	35.0	04	57.1
Total	355	45	12.6	28	62.2
Grand Total	1,358	288	21.2	160	55.5

* Compiled from the Higher Education Directory 1996

** Percentage of the Population

*** Percentage of the Sample

this group, in relation to the sample, was 30 of 55, or 54.5 percent.

The academic operative sample was represented by 45 individuals from a population of 355, or 12.6 percent of the population. The amount of responses from this group, in relation to the sample, was 28 of 45, or 62.2 percent.

The group with the highest rate of response, in relation to the sample, was the nonacademic executive group at 62.5 percent, or 30 of 48 administrators surveyed. In contrast, this group involved the institutional presidents who presented the lowest rate of individual response at 16.6 percent, or 2 of 12 surveyed.

The lowest sample size was the academic operative group, who represented 12.6 of the population. This number was basically influenced by the department chair positions, which included only 26 of 302 positions (8.6 percent of the population). It was relatively difficult to identify the numerous departments in the twelve institutions surveyed and to locate their academic administrators. For this reason, this group had the lowest representation of the total sample. However, this operative level presented an acceptable rate of response of 16 individuals from 26 positions surveyed, representing 61.5 percent of the sample at that level.

Demographic Information

Education

The variable education was measured through question fourteen asking respondents to provide the highest degree attained in their respective

field of study. Table 5 indicates the number and percentage of responses classified by administrator functional category and educational level.

Table 5 indicates that 68 of 160 of the respondents (42.5 percent) hold a doctoral degree, 59 of 160 of them (36.8 percent) hold a Masters degree, 28 of 160 of them (17.5 percent) hold a baccalaureate degree, and 5 of 160 of them (3.1 percent) were graduated in different categories from a classical professional education. As a whole, this table shows that 155 of 160 individuals, or 96.8 percent of the respondents, hold a professional degree in the classical educational structure of doctorate, masters or baccalaureate studies. Only 5 of 160 (3.1 percent) of the respondents have pursued a professional program in a different category or “other” type of studies. In the same vein, the table also shows that the highest frequency of respondents with doctoral degrees (25) are employed as academic executives; the highest frequency of respondents with Masters’ degrees (37) are employed as nonacademic operatives; and the highest frequency of respondents with baccalaureate degrees (24) are working as nonacademic operative officers.

The respondents’ focus of education or field of study for the highest degree completed by administrators is summarized in Table 6. As can be seen from this table, although there seem to be a variety of fields of study, column 3 shows that the highest frequency, 15 of 72 respondents (20.8 percent) in the nonacademic operative group have educational backgrounds in fields identified as “other” fields of study, meaning that they are different from the educational areas specified in the table. However, it also can be

Table 5
Number and Percent of Degree Levels Held by Administrators
 (N = 160)

Administrators	Doctorate		Masters		Baccalaureate		Other		Total
	Number	%	Number	%	Number	%	Number	%	
NONACADEMIC									
Executives	18	60.0	09	30.0	03	10.0	---	---	30
Operatives	08	11.0	37	51.5	24	33.5	03	4.0	72
ACADEMIC									
Executives	25	83.5	03	10.0	01	3.5	01	3.0	30
Operatives	17	61.0	10	35.5	---	---	01	3.5	28
OVERALL / PERCENT	68	42.5	59	36.8	28	17.5	05	3.1	160

Table 6
Number and Percent of Administrators by Fields of Study
N=160

Fields of Study for Degree	Administrators							
	Nonacademic Executives		Nonacademic Operatives		Academic Executives		Academic Operatives	
	Number	%	Number	%	Number	%	Number	%
Accounting	02	7.0	07	9.7	--	--	01	3.5
Biological Sciences	--	--	02	2.7	01	3.3	02	7.1
Business/Economic	04	13.3	11	15.2	02	6.6	05	17.8
Education	08	26.6	09	12.5	09	30.0	04	14.2
Engineering	--	--	08	11.1	01	3.3	--	--
Humanities	03	10.0	03	4.1	06	20.0	04	14.2
Law	02	6.6	--	--	--	--	--	--
Math/Computer Science	01	3.3	03	4.1	02	6.6	--	--
Medicine	--	--	02	2.7	--	--	--	--
Physical Sciences	--	--	01	1.3	--	--	03	10.7
Social Sciences	06	20.0	11	15.2	05	16.6	02	7.1
Other	04	13.3	15	20.8	04	13.3	07	25.0
Total	30	100.0	72	100.0	30	100.0	28	100.0

observed that respondents have a variety of backgrounds, and the highest frequencies of respondents by field of study are: (a) The Business/Economic area, composed of 11 of 72 (15.2 percent) in the nonacademic operative group, (b) A Social Sciences major, composed of 11 of 72 (15.2 percent), also in the nonacademic operative group, (c) The Education area, composed of 9 of 72 (12.5 percent) in the nonacademic operative group; 9 of 30 (30 percent) in the academic executive group; and 8 of 30 (26.6 percent) in the nonacademic executive group, (d) The Engineering area, composed of 8 of 72 (11.1 percent) in the nonacademic operative group, and (e) The Accounting area, composed of 7 of 72 (9.7 percent) respondents in the nonacademic operative functional category.

Experience

Two demographic questions were focused on experience. One question asked the respondents to indicate how many years of higher education institutional management experience they have. The average number of years of institutional management experience among the 160 respondents was 6.5 years. However, when an average of experience was analyzed for each categorical group, in their respective executive and operative functional levels, the management experience was slightly different for each group. Table 7 presents the management experience average of each group.

Table 7
Number of Years of Experience in Current Position, Mean, and Standard Deviation by Administrators' Category and Level

Administrators	Number	Mean	SD
Nonacademic			
Executives	30	9.4	8.18
Operatives	72	5.6	4.01
Academic			
Executives	30	5.2	4.26
Operatives	28	5.9	5.27

Table 8
Number and Percent of Respondents by Years of Experience
N=160

Administrators	Years of Experience									
	0-5 Years		6-10 Years		11-15 Years		16-20 Years		20 or more	
	Number	%	Number	%	Number	%	Number	%	Number	%
Nonacademic										
Executives	03	1.8	08	5.0	05	3.1	06	3.7	08	5.0
Operatives	21	13.1	17	10.6	21	13.1	10	6.2	03	1.8
Academic										
Executives	03	1.8	08	5.0	05	3.1	04	2.5	10	6.2
Operatives	03	1.8	04	2.5	05	3.1	08	5.0	08	5.0
Total	30	18.7	37	23.1	36	22.5	28	17.5	29	18.2

Additional details about the length of the respondents' institutional experience can be identified in Table 8. This table recognizes that the respondents' total frequency by level is distributed evenly in the different five-year intervals utilized to measure experience. In other words, there is almost an identical number of respondents (near 30) for each five-year time interval of experience. The other question, item 13, in the questionnaire asked respondents to state the number of years they have been in their current position. Table 9 shows that 86 of the 160 respondents (53.7 percent) have held their positions between one and five years.

Training

The questionnaire asked respondents to identify whether or not they had received training from their organization or from any other institutions that taught them how to apply qualitative and quantitative techniques in their managerial decision-making processes.

Table 10 shows that 58 of 160 (36.2 percent) of the respondents had received training in qualitative techniques, while 63 of 160 (39.3 percent) of the respondents had received training in quantitative techniques. In addition to this finding, it is important to note that the nonacademic executive group presents the highest rate of positive responses (60 percent) related to training in qualitative techniques, followed by the academic executive group with a rate of positive responses of 36.6 percent. Similarly, the nonacademic executive group also had the highest rate of positive responses (63.3 percent) related to training in quantitative techniques. This percentage almost doubled for the group ranked in second place, the nonacademic operative group.

Table 9
Number and Percent of Respondents by Years in Current Position

Administrators	Years in Current Position										Total	
	0-5 Years		6-10 Years		11-15 Years		16-20 Years		20 or more			
	Number	%	Number	%	Number	%	Number	%	Number	%		
<hr/>												
Nonacademic												
Executives	12	7.5	07	4.4	05	3.1	02	1.2	04	2.5	30	
Operatives	40	25.0	20	12.5	10	6.2	--	--	02	1.2	72	
Academic												
Executives	18	11.2	09	5.6	02	1.2	--	--	01	0.6	30	
Operatives	16	10.0	04	2.5	06	3.8	01	0.6	01	0.6	28	
Total	86	53.7	40	25.0	23	14.3	03	1.8	08	5.0	160	

Table 10
Number and Percent of Respondents Who Received Institutional Training in Qualitative and Quantitative Techniques
N=160

Administrators	Number	Qualitative Techniques				Number	Quantitative Techniques			
		YES	%	NO	%		YES	%	NO	%
Nonacademic										
Executives	30	18	60.0	12	40.0	30	19	63.3	11	36.6
Operatives	72	23	31.9	49	68.0	72	26	36.1	46	63.8
Academic										
Executives	30	11	36.6	19	63.3	30	10	33.3	20	66.6
Operatives	28	6	21.4	22	78.5	28	8	28.5	20	71.4
Total	160	58	36.2	102	63.7	160	63	39.3	97	60.6

Consequently, it may be suggested that the respondents grouped in the nonacademic executive category have the best groundwork, in terms of training experience for applying qualitative and quantitative techniques to institutional decision-making situations.

Software Packages Used

The questionnaire inquired about the application of relevant or specific software packages for analyzing data or solving departmental problems.

Table 11 reports that the use of specific computer programs in qualitative techniques is lower than for quantitative techniques. These findings may agree with the belief that the available software for qualitative techniques is more limited than the software for quantitative techniques. However, there is evidence that there exist software packages specifically oriented towards applying qualitative techniques (i.e. *Cyberquest*, *NGT Software*, *Symantec Act*, *Checklists*). Only 21.6 percent of the respondents indicated that they have used software specifically related to qualitative techniques. By contrast, 54.4 percent of the respondents have used special software packages related to quantitative techniques at the departmental unit levels. In this respect, there is a uniform distribution in the usage of quantitative software packages in the two administrative categories of executive and operative levels.

Table 11
Number and Percent of Respondents Whose Departments Use Software Packages

Administrators	Qualitative Techniques					Quantitative Techniques				
	Number	YES	%	NO	%	Number	YES	%	NO	%
Nonacademic										
Executives	30	10	33.3	20	66.7	30	17	56.7	13	43.3
Operatives	70	13	18.5	57	81.4	71	43	60.5	28	39.4
Academic										
Executives	30	07	23.3	23	76.7	30	13	43.3	17	56.7
Operatives	27	04	14.8	23	85.1	27	13	48.1	14	51.8
Total	157	34	21.6	123	78.3	158	86	54.4	72	45.5

Computer Usage at the Departmental Level

The extent of computer usage in the decision-making processes was measured on a four-point Likert-type scale with “1” representing not used, “2” representing occasionally used, “3” representing frequently used, and “4” denoting extensively used. Respondents were asked to select one situation

that best corresponded with those categories at the departmental level.

Table 12 shows that 41.8 percent of the respondents “frequently” use the computer for decision-making, and 39.3 percent of them “occasionally” use the computer for assistance in the decision-making process at the departmental level. The academic operative category has the highest frequency of use, with 15 respondents of 28 (53.5 percent) using the computer as an instrument for decision-making.

Perceived Style of Decision-Making

Question six of the questionnaire asked about three different procedures or styles of decision-making experienced at the institutional or departmental levels. Respondents were asked to select one style that they perceived as being the most commonly applied in their organization or departmental unit.

Table 13 illustrates that a high percentage of the four groups of respondents considered the “democratic” style as the most frequently used style in their organization or departmental unit. However, it is important to note, in column 2, that 20.8 percent of the respondents in the nonacademic

Table 12
Number and Percent of Respondent Computer Usage in Decision- Making at the
Departmental Level
N=160

Administrators	Not Used		Occasionally Used		Frequently Used		Extensively Used		Total
	Number	%	Number	%	Number	%	Number	%	Number
Nonacademic									
Executives	01	3.3	10	33.3	15	50.0	04	13.3	30
Operatives	02	2.7	31	43.0	25	34.7	14	19.4	72
Academic									
Executives	04	13.3	13	43.3	12	40.0	01	3.3	30
Operatives	02	7.1	09	32.1	15	53.5	02	6.7	28
Total	09	5.6	63	39.3	67	41.8	21	13.1	160

Table 13
Number and Percent of Respondent Styles of Decision-Making at the Organizational Level
N=160

Administrators	Autocratic		Democratic		Laissez-faire		Total
	Number	%	Number	%	Number	%	Number
Nonacademic							
Executives	01	3.3	28	93.3	01	3.3	30
Operatives	15	20.8	51	70.8	06	8.3	72
Academic							
Executives	03	10.0	24	80.0	03	10.0	30
Operatives	00	00.0	24	85.7	04	14.2	28
Total	19	11.8	127	79.3	14	8.8	160

operative group believed that the “autocratic” style was the form of institutional decision-making applied in their organizations.

Statistical Analysis of the Primary Research Questions

Degree of Familiarity

The first research question was concerned with the degree of familiarity or expertise that nonacademic and academic administrators have with the qualitative and quantitative techniques used in the decision-making process. The method used in this analysis is termed the aggregated score or weighted total frequency score for each technique. The purpose of using this technique was to weigh the frequency according to the respondent’s degree of expertise in each methodology. The rationale was that the respondent’s ability to judge accurately one technique over another is directly related to the degree of knowledge possessed about either methodology. Then, the familiarity variable was measured on a four-point Likert scale, ranging from (1=not familiar) to (4=very familiar or expert). An aggregated score and a mean for each technique were computed to facilitate their ranking.

A second test for examining the data and assisting in identification of differences related to familiarity in the diverse groups was the General Linear Model (GLM). In this procedure, a “three way analysis of variance” was performed for nonacademic and academic categories and for executive and operative levels of respondents in both qualitative and quantitative management techniques.

Table 14 summarizes the total number and percentage of responses to the questionnaire that indicated the level of familiarity with each technique. As Table 14 shows, Brainstorming and Checklists are more familiar qualitative techniques to the respondents, and Benchmarking and Cost-Benefit Analysis are the more familiar quantitative techniques.

Specifically, Brainstorming ranked first among of the qualitative techniques. Sixty three percent (63%) of the respondents reported to be “very familiar” or experts in its use, and 34 percent of them indicated that they were “somewhat familiar” with this technique. In regard to Checklists, 49 percent of the respondents reported that they were “very familiar” with it, and 36 percent of them indicated that they were “somewhat familiar” with this technique.

On the other hand, the data also shows that Cost-Benefit Analysis ranked in first place among the quantitative techniques. A thirty nine (39%) percent of the respondents reported that they were “very familiar” with it, and 46 percent were “somewhat familiar” with Cost-Benefit Analysis as a quantitative technique. In the same vein, Benchmarking ranked second as a quantitative technique. Thirty four percent (34%) of the respondents reported that they were “very familiar” with Benchmarking, and 48 percent of them indicated that they were “somewhat familiar” with it as a quantitative technique.

Table 14
Number and Percent of Responses Related to Degree of Familiarity with
 Qualitative and Quantitative Techniques (All Respondents)

TECHNIQUES	Degree of Familiarity *								
	Total Number	1 Number	%	2 Number	%	3 Number	%	4 Number	%
QUALITATIVE									
Brainstorming	159	1	0.6	4	2.4	54	34	100	63
Checklists	160	9	6	15	9	58	36	78	49
Job Enrichment/Enhancement	157	27	17	35	22	54	34	41	26
Management by Objectives (MBO)	160	6	4	30	19	66	41	58	36
Management Information System (MIS)	159	19	12	37	23	61	38	42	27
Nominal Group Technique	160	77	48	44	28	20	12	19	12
Theory X & Y	159	70	44	35	22	29	18	25	16
QUANTITATIVE									
Benchmarking	160	4	2	24	16	77	48	55	34
Cost-Benefit Analysis	159	6	4	18	11	73	46	62	39
Forecasting: Regression Analysis	159	16	10	53	33	53	33	37	24
Linear Programming	159	44	27	64	40	41	26	10	7
Simulation Models	160	28	17	62	39	53	33	17	11
Statistic: Significance Testing	158	17	10	56	35	52	33	33	21
TQM: Cause-Effect Analysis (Fishbone Diagram)	157	21	13	44	28	74	47	18	12

* 1=Not familiar 2=Vaguely familiar 3=Somewhat familiar 4=Very familiar

Table 15 displays the aggregated score, mean, standard deviation and rank order of each technique related to the variable degree of familiarity. In this table, the aggregated score for each technique was calculated by multiplying the number total of frequencies of each option by its respective value from 1 to 4 assigned in the scale for this question. Table 15 also permits the identification that the aggregated score and the means are marginally higher for qualitative techniques than for quantitative techniques. This may suggest that respondents are somewhat familiar with or have more expertise in qualitative techniques than quantitative techniques.

Table 16 presents the number of responses, according to each option, from the nonacademic executive group related to degree of familiarity with qualitative and quantitative techniques. It can be identified that 25 of 30 respondents are “very familiar” with Brainstorming as a qualitative technique, and 17 of the 30 are “very familiar” with Cost-Benefit Analysis in quantitative techniques.

Table 17 shows the aggregated score, mean, standard deviation and rank order in terms of familiarity for the nonacademic executive group. As can be identified, there is a slight movement in the ranking of the qualitative techniques compared with the ranking of the table 15. Job Enrichment/Enhancement for this group occupied second place in degree of familiarity with the qualitative techniques, indicating a greater level of expertise in this category of respondents with this technique than with the Checklists technique.

Table 15
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses on Degree of Familiarity with Qualitative and Quantitative Techniques
 (All Respondents)

TECHNIQUES	Degree of Familiarity *				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	159	571	3.59	0.57	1
Checklists	160	525	3.28	0.85	2
Job Enrichment/Enhancement	157	423	2.69	1.04	5
Management by Objectives (MBO)	160	496	3.10	0.83	3
Management Information System (MIS)	159	444	2.79	0.97	4
Nominal Group Technique	160	301	1.88	1.03	7
Theory X & Y	159	327	2.05	1.11	6
QUANTITATIVE					
Benchmarking	160	505	3.15	0.75	2
Cost-Benefit Analysis	159	509	3.20	0.78	1
Forecasting: Regression Analysis	159	429	2.69	0.93	3
Linear Programming	159	335	2.10	0.88	7
Simulation Models	160	380	2.37	0.89	6
Statistic: Significance Testing	158	417	2.63	0.93	4
TQM: Cause-Effect Analysis (Fishbone Diagram)	157	403	2.56	0.86	5

* 1=Not familiar 2=Vaguely familiar 3=Somewhat familiar 4=Very familiar

Table 16
Number of Responses from the Nonacademic Executive Group Related to Degree of Familiarity with Qualitative and Quantitative Techniques

TECHNIQUES	Degree of Familiarity *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	30	0	0	5	25
Checklists	30	1	2	11	16
Job Enrichment/Enhancement	29	5	7	8	9
Management by Objectives (MBO)	30	2	5	12	11
Management Information System (MIS)	30	1	5	16	8
Nominal Group Technique	30	16	8	4	2
Theory X & Y	30	13	7	3	7
QUANTITATIVE					
Benchmarking	30	1	2	12	15
Cost-Benefit Analysis	30	1	0	12	17
Forecasting: Regression Analysis	30	3	7	9	11
Linear Programming	30	8	11	10	1
Simulation Models	30	5	10	9	6
Statistic: Significance Testing	29	1	11	10	7
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	3	10	10	5

* 1=Not familiar 2=Vaguely familiar 3=Somewhat familiar 4=Very familiar

Table 17
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses on Degree of Familiarity of the Nonacademic Executive Group with Qualitative and Quantitative Techniques

TECHNIQUES	Degree of Familiarity				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	30	115	3.83	0.38	1
Checklists	30	100	3.33	0.77	2
Job Enrichment/Enhancement	29	79	2.72	1.09	5
Management by Objectives (MBO)	30	92	3.06	0.90	3
Management Information System (MIS)	30	91	3.03	0.76	4
Nominal Group Technique	30	52	1.73	0.94	7
Theory X & Y	30	64	2.13	1.22	6
QUANTITATIVE					
Benchmarking	30	101	3.36	0.76	2
Cost-Benefit Analysis	30	105	3.50	0.68	1
Forecasting: Regression Analysis	30	88	2.93	1.01	3
Linear Programming	30	64	2.13	0.86	7
Simulation Models	30	76	2.53	1.00	6
Statistic: Significance Testing	29	81	2.79	0.86	4
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	73	2.60	0.91	5

Table 18 shows the number of responses from the academic executive group for each option related to degree of familiarity with qualitative and quantitative techniques. It can be identified that 19 of 29 respondents in this group are “very familiar” with Brainstorming in qualitative techniques, and 9 of 29 respondents are “very familiar” with Cost-Benefit Analysis in quantitative techniques.

Table 19 shows the aggregated score, mean, standard deviation and rank order related to degree of familiarity of the academic executive group with qualitative and quantitative techniques. For this group, Brainstorming and Checklists are the more familiar qualitative techniques, and Benchmarking and Cost-Benefit Analysis are the more familiar quantitative techniques. Statistic (significance testing) was third in the order of importance among the quantitative techniques. This ranking is improved in relation to Table 15, and indicates a higher degree of familiarity with this technique for this categorical group than for the respondents of the other groups.

Table 20 displays the number of responses for each option from the nonacademic operative group related to degree of familiarity with qualitative and quantitative techniques. It can be identified that 38 of 71 respondents are “very familiar” with Checklists in qualitative techniques, and 28 of 72 are “very familiar” with Cost-Benefit Analysis in quantitative techniques.

Table 18
Number of Responses from the Academic Executive Group Related to Degree of Familiarity with Qualitative and Quantitative Techniques

TECHNIQUES	Degree of Familiarity *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	29	0	0	10	19
Checklists	30	1	0	11	18
Job Enrichment/Enhancement	29	5	2	10	12
Management by Objectives (MBO)	30	0	5	10	15
Management Information System (MIS)	30	2	11	13	4
Nominal Group Technique	30	15	8	4	3
Theory X & Y	30	14	2	7	7
QUANTITATIVE					
Benchmarking	30	2	5	15	8
Cost-Benefit Analysis	29	1	3	16	9
Forecasting: Regression Analysis	29	4	12	7	6
Linear Programming	30	10	11	6	3
Simulation Models	30	6	12	9	3
Statistic: Significance Testing	30	3	10	7	10
TQM: Cause-Effect Analysis (Fishbone Diagram)	30	6	14	9	1

* 1=Not familiar 2=Vaguely familiar 3=Somewhat familiar 4=Very familiar

Table 19
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses on Degree of Familiarity of the Academic Executive Group with Qualitative and Quantitative Techniques

TECHNIQUES	Degree of Familiarity				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	29	106	3.65	0.48	1
Checklists	30	106	3.59	0.68	2
Job Enrichment/Enhancement	29	87	3.00	1.10	4
Management by Objectives (MBO)	30	100	3.33	0.75	3
Management Information System (MIS)	30	79	2.63	0.80	5
Nominal Group Technique	30	55	1.83	1.01	7
Theory X & Y	30	67	2.23	1.27	6
QUANTITATIVE					
Benchmarking	30	89	2.96	0.85	2
Cost-Benefit Analysis	29	91	3.13	0.74	1
Forecasting: Regression Analysis	29	73	2.51	0.98	4
Linear Programming	30	62	2.06	0.98	7
Simulation Models	30	69	2.30	0.91	5
Statistic: Significance Testing	30	84	2.80	1.03	3
TQM: Cause-Effect Analysis (Fishbone Diagram)	30	65	2.16	0.79	6

Table 20
Number of Responses from the Nonacademic Operative Group Related to Degree of Familiarity with Qualitative and Quantitative Techniques

TECHNIQUES	Degree of Familiarity *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	72	0	4	27	41
Checklists	71	4	9	20	38
Job Enrichment/Enhancement	71	11	18	27	15
Management by Objectives (MBO)	72	3	14	31	24
Management Information System (MIS)	72	8	15	26	23
Nominal Group Technique	71	34	19	8	10
Theory X & Y	71	31	19	13	8
QUANTITATIVE					
Benchmarking	72	0	9	39	24
Cost-Benefit Analysis	72	2	4	38	28
Forecasting: Regression Analysis	72	8	23	28	13
Linear Programming	71	19	32	18	2
Simulation Models	72	12	28	28	4
Statistic: Significance Testing	71	11	26	25	9
TQM: Cause-Effect Analysis (Fishbone Diagram)	71	9	17	36	9

* 1=Not familiar 2=Vaguely familiar 3=Somewhat familiar 4=Very familiar

Table 21 shows the aggregated score, mean, standard deviation and ranking order related to degree of familiarity in the nonacademic operative group with qualitative and quantitative techniques. The ranking indicates that Checklists and Brainstorming are the more familiar qualitative techniques for this group, and Cost-Benefit Analysis and Benchmarking are the more familiar quantitative techniques. The ranking also shows a slight movement of position for the Management Information System (MIS) technique, improving its rank order to fourth place in relation to the other groups. This may suggest that this group has a higher degree of familiarity with this technique than the nonacademic executive and academic executive groups.

Table 22 refers to the number of responses for each option from the academic operative group related to degree of familiarity with qualitative and quantitative techniques. It can be identified that 15 of 28 respondents are “very familiar” with Brainstorming in qualitative techniques, and 8 of 28 respondents are “very familiar” with Benchmarking in quantitative techniques.

Table 23 indicates the aggregated score, mean, standard deviation and rank order related to the degree of familiarity of the academic operative group with qualitative and quantitative techniques. In this table, it can be noted that Brainstorming and Management by Objectives are the most familiar qualitative techniques to this group, and Benchmarking and TQM (Cause-Effect Analysis) are the most familiar quantitative techniques.

Table 21
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses on Degree of Familiarity from the Nonacademic Operative Group with Qualitative and Quantitative Techniques

TECHNIQUES	Degree of Familiarity				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	72	253	3.51	0.60	1
Checklists	71	234	3.29	0.90	2
Job Enrichment/Enhancement	71	188	2.64	0.98	5
Management by Objectives (MBO)	72	220	3.05	0.83	3
Management Information System (MIS)	72	208	2.88	0.98	4
Nominal Group Technique	71	126	1.91	1.07	7
Theory X & Y	71	140	1.97	1.04	6
QUANTITATIVE					
Benchmarking	72	231	3.20	0.64	2
Cost-Benefit Analysis	72	236	3.27	0.69	1
Forecasting: Regression Analysis	72	190	2.66	0.89	3
Linear Programming	71	145	2.04	0.80	7
Simulation Models	72	168	2.33	0.82	6
Statistic: Significance Testing	71	174	2.45	0.90	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	71	187	2.63	0.86	4

Table 22
Number of Responses from the Academic Operative Group Related to Degree of Familiarity with Qualitative and Quantitative Techniques

TECHNIQUES	Degree of Familiarity *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	28	1	0	12	15
Checklists	28	3	4	15	6
Job Enrichment/Enhancement	28	6	8	9	5
Management by Objectives (MBO)	28	1	6	13	8
Management Information System (MIS)	27	8	6	6	7
Nominal Group Technique	28	11	9	4	4
Theory X & Y	28	12	7	6	3
QUANTITATIVE					
Benchmarking	28	1	8	11	8
Cost-Benefit Analysis	28	2	11	7	8
Forecasting: Regression Analysis	28	1	11	9	7
Linear Programming	28	7	10	7	4
Simulation Models	28	5	12	7	4
Statistic: Significance Testing	28	2	9	10	7
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	2	4	19	3

1=Not familiar 2=Vaguely familiar 3=Somewhat familiar 4=Very familiar

Table 23
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses on Degree of Familiarity of the Academic Operative Group with Qualitative and Quantitative Techniques

TECHNIQUES	Degree of Familiarity				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	28	97	3.46	0.69	1
Checklists	28	80	2.85	0.89	3
Job Enrichment/Enhancement	28	69	2.46	1.03	4
Management by Objectives (MBO)	28	84	3.00	0.81	2
Management Information System (MIS)	27	66	2.44	1.18	5
Nominal Group Technique	28	57	2.03	1.07	6
Theory X & Y	28	56	2.00	1.05	7
QUANTITATIVE					
Benchmarking	28	82	2.92	0.85	1
Cost-Benefit Analysis	28	77	2.75	0.96	5
Forecasting: Regression Analysis	28	78	2.78	0.87	3
Linear Programming	28	64	2.28	1.01	7
Simulation Models	28	66	2.35	0.95	6
Statistic: Significance Testing	28	78	2.78	0.91	4
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	79	2.82	0.72	2

This may suggest that respondents in this group have a greater degree of familiarity with Management by Objectives and TQM techniques than respondents in the nonacademic category at the same operative level and respondents from the nonacademic and academic executive levels.

Table 24 details the differences in degree of familiarity with management techniques by category and by levels of administrators. The MINITAB general linear model was used to make the computations required to run the analysis of variance. As can be seen in this table, all F values exceed their appropriate critical values of $< .05$ level which leads to the judgment that there are no significant statistical differences between group means in the responses. Averaged across factors (qualitative and quantitative techniques), nonacademic administrators and academic administrators have a similar degree of familiarity with the techniques. It also can be noted that averaged across techniques, the observed values of the mean responses of the executive level administrators do not vary significantly from the observed values of the mean responses of the operative levels of administrators in each category (nonacademic and academic).

Table 24
Differences in Familiarity with Management Techniques by Category and by Levels of Administrator
N=160

Source*	DF	Seq SS	Adj SS	Adj MS	F	p
Category	1	0.161	0.294	0.294	1.18	.28
Levels	1	0.462	0.462	0.462	1.85	.17
Error	157	39.220	39.220	0.249		
Total	159	39.844				

Seq=Sequential sum of squares (each term is fit after all other terms in the model)

Adj=Adjusted sum of squares

Management techniques refer to qualitative and quantitative techniques

* Category refers to type of administrators (nonacademic and academic)

* Levels refer to the two levels of administrators (executive and operative)

Extent of Use of the Techniques

For the purpose of this research, the extent of use involved the ability to apply specific qualitative and quantitative techniques in the planning, directing, reporting, and controlling functions.

The second question of the questionnaire was organized to evaluate the administrators' opinions about the extent of use of the selected techniques in each one of the indicated functions. In this sense, an aggregated score and a mean were computed for ranking each technique in order to analyze each categorical group about the extent of use of the techniques in the administrative tasks of planning, directing, reporting, and controlling.

The aggregated score for each technique and each function was calculated using the number or total frequency obtained in each option, multiplying it by the respective value on the scale, from 1 (never use) to 4 (always use), assigned to this question in the questionnaire.

Extent of Use in Planning

Table 25 presents the total number of responses related to the extent of use of qualitative and quantitative techniques in planning activities. This table shows that Brainstorming and Checklists are the qualitative techniques most frequently used in planning functions. Fifty nine (59) of 157 respondents "always use" Brainstorming in planning activities, and 77 of 157 "frequently use" this technique in their planning activities. On the other hand, 45 of 158 respondents "always use" Checklists in their planing tasks,

Table 25
Number of Responses Related to the Extent of Use of Qualitative and Quantitative
 Techniques in Planning Activities (All Respondents)

TECHNIQUES	Extent of Use in Planning *				
	Total Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	157	0	21	77	59
Checklists	158	10	26	77	45
Job Enrichment/Enhancement	154	41	52	49	12
Management by Objectives (MBO)	157	22	48	63	24
Management Information System (MIS)	153	38	42	58	15
Nominal Group Technique	153	112	24	14	3
Theory X & Y	152	104	29	15	4
QUANTITATIVE					
Benchmarking	157	8	35	82	32
Cost-Benefit Analysis	157	11	25	78	43
Forecasting: Regression Analysis	156	47	50	44	15
Linear Programming	154	84	47	19	4
Simulation Models	154	68	59	25	2
Statistic: Significance Testing	141	65	51	22	3
TQM: Cause-Effect Analysis (Fishbone Diagram)	150	58	39	43	10

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

and 77 of 158 of them “frequently use” this qualitative technique in their planning activities. Similarly, it also can be identified that Cost-Benefit Analysis and Benchmarking are the quantitative techniques more frequently used in planning duties in the organizations surveyed. Specifically, 43 of 157 respondents indicated that they “always use” Cost-Benefit Analysis in their planning tasks, and 78 of them “frequently use” this technique in planning. With regard to Benchmarking, 32 of 157 respondents indicated that they “always use” this technique in planning, and 82 of 157 of them indicated that they “frequently use” this technique in planning tasks.

Table 26 summarizes the aggregated score, means, standard deviation, and rank order of responses on the extent of use of qualitative and quantitative techniques in planning activities. It can be noted that the aggregated score and mean of frequencies are marginally higher for qualitative techniques than for quantitative techniques. This suggests that qualitative techniques have a greater extent of application by the respondents in planning than the techniques grouped as quantitative.

Table 27 presents the number of responses from the nonacademic executive group related to the extent of use of qualitative and quantitative techniques in planning activities. It can be noted that 15 of 30 respondents “always use” Brainstorming, of the qualitative techniques, and 14 of 30 of them “frequently use” it in their planning activities. On the other hand, 13 of 29 respondents “always use” Cost-

Table 26
Aggregated Score, Mean, Standard Deviation, and Ranking of Total Responses on Extent of Use of Qualitative and Quantitative Techniques in Planning Activities
 (All Respondents)

TECHNIQUES	Extent of Use in Planning*				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	157	509	3.24	0.67	1
Checklists	158	473	2.99	0.84	2
Job Enrichment/Enhancement	154	340	2.20	0.92	5
Management by Objectives (MBO)	157	403	2.56	0.91	3
Management Information System (MIS)	153	356	2.32	0.95	4
Nominal Group Technique	153	214	1.39	0.73	7
Theory X & Y	152	219	1.46	0.77	6
QUANTITATIVE					
Benchmarking	157	452	2.87	0.78	2
Cost-Benefit Analysis	157	467	2.97	0.84	1
Forecasting: Regression Analysis	156	339	2.17	0.97	3
Linear Programming	154	251	1.62	0.79	7
Simulation Models	154	269	1.74	0.77	5
Statistic: Significance Testing	141	245	1.73	0.79	6
TQM: Cause-Effect Analysis (Fishbone Diagram)	150	305	2.03	0.97	4

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 27
Number of Responses from the Nonacademic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Planning Activities

TECHNIQUES	Extent of Use in Planning *				
	Total Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	30	0	1	14	15
Checklists	30	2	6	14	8
Job Enrichment/Enhancement	29	7	14	5	3
Management by Objectives (MBO)	30	2	7	13	8
Management Information System (MIS)	28	5	9	13	1
Nominal Group Technique	29	21	4	4	0
Theory X & Y	29	17	6	5	1
QUANTITATIVE					
Benchmarking	29	0	2	18	9
Cost-Benefit Analysis	29	1	0	15	13
Forecasting: Regression Analysis	30	7	15	6	2
Linear Programming	29	16	10	3	0
Simulation Models	29	14	10	4	1
Statistic: Significance Testing	29	11	14	3	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	29	11	8	9	1

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Benefit Analysis, of the quantitative techniques, and 15 of 29 of them “frequently use” it for their planning tasks.

Table 28 presents the aggregated score, mean, standard deviation and ranking of responses from the nonacademic executive group on the extent of use of qualitative and quantitative techniques in planning activities. In this table, it can be observed that the ranking in terms of extent of use in planning of quantitative techniques differs slightly for this group in relation to the ranking of total groups presented in table 26. The technique Statistic (Significance Testing) ranked in fifth place, indicating that for this group this technique is more used in planning than the Simulation technique.

Table 29 displays the number of responses from the nonacademic operative group related to the extent of use of qualitative and quantitative techniques in planning activities. It can be noted that although a different number of frequencies for each option were marked on the Brainstorming and Checklists techniques by this group, the variable extent of use in planning activities exhibited a similar aggregated score on degree of use. In this sense, there are 18 of 72 respondents who “always use” Brainstorming in planning activities, and 43 of 72 of them who “frequently use” it in planning. In regards to Checklists, there are 21 of 72 respondents who “always use” Checklists, and 40 of 72 who “frequently use” it in planning tasks.

Table 28
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Nonacademic Executive Group on the Extent of Use of Qualitative and Quantitative Techniques in Planning Activities

TECHNIQUES	Extent of Use in Planning				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	30	104	3.46	0.57	1
Checklists	30	88	2.93	0.86	2
Job Enrichment/Enhancement	29	62	2.13	0.91	5
Management by Objectives (MBO)	30	87	2.90	0.88	3
Management Information System (MIS)	28	66	2.35	0.82	4
Nominal Group Technique	29	41	1.41	0.73	7
Theory X & Y	29	48	1.65	0.89	6
QUANTITATIVE					
Benchmarking	29	94	3.24	0.57	2
Cost-Benefit Analysis	29	98	3.37	0.67	1
Forecasting: Regression Analysis	30	63	2.10	0.84	3
Linear Programming	29	45	1.55	0.68	7
Simulation Models	29	50	1.72	0.84	6
Statistic: Significance Testing	29	52	1.79	0.77	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	29	58	2.00	0.92	4

Table 29
Number of Responses from the Nonacademic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Planning Activities

TECHNIQUES	Extent of Use in Planning *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	72	0	11	43	18
Checklists	72	3	8	40	21
Job Enrichment/Enhancement	69	16	24	24	5
Management by Objectives (MBO)	70	6	26	27	11
Management Information System (MIS)	69	16	19	25	9
Nominal Group Technique	67	52	10	4	1
Theory X & Y	68	53	11	3	1
QUANTITATIVE					
Benchmarking	72	1	17	38	16
Cost-Benefit Analysis	72	3	14	38	17
Forecasting: Regression Analysis	70	18	22	20	10
Linear Programming	70	39	19	9	3
Simulation Models	69	28	29	11	1
Statistic: Significance Testing	58	26	20	11	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	70	22	23	19	6

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Similarly, in this group, there are 16 of 72 respondents who “always use” Benchmarking in planning tasks, and 38 of 72 of them who “frequently use” it in planning activities. In regards to Cost-Benefit analysis, there are 17 of 72 respondents who “always use” this technique in planning, and 38 of 72 of them who “frequently use” it in planning.

Table 30 details the aggregated score, mean, standard deviation and ranking of responses from the nonacademic operative group related to extent of use of qualitative and quantitative techniques in planning activities. Here, equivalent mean scores can be noted between Brainstorming and Checklists among the qualitative techniques, and Benchmarking and Cost-Benefit Analysis among the quantitative techniques. However, Brainstorming and Benchmarking ranked respectively in first place for having a lower standard deviation. The ranking also shows slightly more movement in the order of the less frequently used techniques than was found in the aggregated scores of the same techniques in the total group of respondents.

Table 31 shows the number of responses from the academic executive group related to the extent of use of qualitative and quantitative techniques in planning activities. It can be noted that for this group, the qualitative techniques more frequently used in planning are Brainstorming and Checklists, and the quantitative techniques more frequently used are Cost-Benefit Analysis and Benchmarking. There are 12 of 29 respondents who “always use” Brainstorming in planning and 12 of 29 of them who

Table 30
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Nonacademic Operative Group on the Extent of Use of Qualitative and Quantitative Techniques in Planning Activities

TECHNIQUES	Extent of Use in Planning				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	72	223	3.09	0.63	1
Checklists	72	223	3.09	0.75	2
Job Enrichment/Enhancement	69	156	2.26	0.90	5
Management by Objectives (MBO)	70	183	2.61	0.85	3
Management Information System (MIS)	69	165	2.39	0.98	4
Nominal Group Technique	67	88	1.31	0.65	6
Theory X & Y	68	88	1.29	0.62	7
QUANTITATIVE					
Benchmarking	72	213	2.95	0.72	1
Cost-Benefit Analysis	72	213	2.95	0.77	2
Forecasting: Regression Analysis	70	162	2.31	1.01	3
Linear Programming	70	116	1.65	0.86	7
Simulation Models	69	123	1.78	0.76	5
Statistic: Significance Testing	58	103	1.77	0.81	6
TQM: Cause-Effect Analysis (Fishbone Diagram)	70	149	2.12	0.96	4

Table 31
Number of Responses from the Academic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Planning Activities

TECHNIQUES	Extent of Use in Planning *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	29	0	5	12	12
Checklists	28	1	6	12	9
Job Enrichment/Enhancement	28	10	8	8	2
Management by Objectives (MBO)	28	6	10	8	4
Management Information System (MIS)	28	5	12	10	1
Nominal Group Technique	29	20	5	3	1
Theory X & Y	27	18	3	5	1
QUANTITATIVE					
Benchmarking	28	4	8	14	2
Cost-Benefit Analysis	28	3	7	12	6
Forecasting: Regression Analysis	28	13	5	10	0
Linear Programming	27	18	4	5	0
Simulation Models	28	13	10	5	0
Statistic: Significance Testing	27	15	8	4	0
TQM: Cause-Effect Analysis (Fishbone Diagram)	23	14	4	5	0

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

“frequently use” it in planning. Similarly, there are 9 of 28 who “always use” Checklists in planning, and 12 of 28 who “frequently use” it in planning activities.

On the other hand, there are 6 of 28 respondents who “always use” Cost-Benefit Analysis in planning, and 12 of 28 who “frequently use” it in planning. Similarly, there are 2 of 28 respondents who “always use” Benchmarking in planning, and 14 of 28 of them who “frequently use” it in planning.

Table 32 summarizes the aggregated score, mean, standard deviation and ranking of responses from the academic executive group related to the extent of use of qualitative and quantitative techniques in planning activities. Here, the most relevant change identified in rank order is that Simulation technique, of the quantitative techniques, occupied the fourth place in ranking for this group.

Table 33 details the number of responses from the academic operative group related to the extent of use of qualitative techniques in planning activities. It can be observed that for this group, the qualitative techniques more frequently used in planning are Brainstorming and Management Information System (MIS), and the quantitative techniques more used in planning are Cost-Benefit analysis and Benchmarking. Fourteen (14) of 28 respondents indicated that they “always use” Brainstorming in planning tasks, and 8 of 28 of them “frequently use” it for planning tasks. Similarly, 4 of 28 respondents indicated that they “always

Table 32
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Academic Executive Group on the Extent of Use of Qualitative and Quantitative Techniques in Planning Activities

TECHNIQUES	Extent of Use in Planning				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	29	94	3.24	0.73	1
Checklists	28	85	3.03	0.83	2
Job Enrichment/Enhancement	28	58	2.07	0.97	5
Management by Objectives (MBO)	28	66	2.35	0.98	3
Management Information System (MIS)	28	63	2.25	0.79	4
Nominal Group Technique	29	43	1.48	0.82	7
Theory X & Y	27	43	1.59	0.93	6
QUANTITATIVE					
Benchmarking	28	70	2.50	0.83	2
Cost-Benefit Analysis	28	77	2.75	0.92	1
Forecasting: Regression Analysis	28	53	1.89	0.91	3
Linear Programming	27	41	1.51	0.80	7
Simulation Models	28	48	1.71	0.76	4
Statistic: Significance Testing	27	43	1.59	0.74	6
TQM: Cause-Effect Analysis (Fishbone Diagram)	23	37	1.60	0.83	5

Table 33
Number of Responses from the Academic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Planning Activities

TECHNIQUES	Extent of Use in Planning *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	28	2	4	8	14
Checklists	28	4	6	11	7
Job Enrichment/Enhancement	28	8	6	12	2
Management by Objectives (MBO)	28	8	4	15	1
Management Information System (MIS)	28	12	2	10	4
Nominal Group Technique	28	19	5	3	1
Theory X & Y	28	16	9	2	1
QUANTITATIVE					
Benchmarking	28	3	8	12	5
Cost-Benefit Analysis	28	4	4	13	7
Forecasting: Regression Analysis	28	9	8	8	3
Linear Programming	28	11	14	2	1
Simulation Models	28	13	10	5	0
Statistic: Significance Testing	27	13	9	4	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	11	4	10	3

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

use” Management Information System in planning, and 10 of 28 of them “frequently use” it in planning activities. On the other hand, 5 of 28 respondents “always use” Benchmarking in planning tasks, and 12 of 28 of them “frequently use” it in planning. Seven (7) of 12 respondents indicated they “always use” Cost-Benefit Analysis in planning, and 13 of 28 of them “frequently use” it in planning functions.

Table 34 summarizes the aggregated score, mean, standard deviation and rank order of responses from the academic operative group related to the extent of use of qualitative and quantitative techniques in planning activities. The issue most relevant to note in this table is the fourth place ranking of Job Enrichment/Enhancement. This group manifested a greater use of this technique in planning activities than the other groups studied.

Table 35 details the results of testing differences on the extent of use in planning, using management techniques (qualitative and quantitative) by category (nonacademic and academic administrators) and by level (executive and operative). In this table, it can be noted that group differences by category (nonacademic and academic), and levels (executive and operative) are not statistical significant. It can be concluded that differences between management techniques observed among the groups did not depend upon the category and level of performance relative to the extent of use in planning by the respondents.

Table 34
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Academic Operative Group on the Extent of Use of Qualitative and Quantitative Techniques in Planning Activities

TECHNIQUES	Extent of Use in Planning				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	28	90	3.21	0.95	1
Checklists	28	77	2.75	1.00	2
Job Enrichment/Enhancement	28	64	2.28	0.97	4
Management by Objectives (MBO)	28	65	2.32	0.94	3
Management Information System (MIS)	28	62	2.21	1.16	5
Nominal Group Technique	28	42	1.50	0.83	7
Theory X & Y	28	44	1.57	0.79	6
QUANTITATIVE					
Benchmarking	28	75	2.67	0.90	2
Cost-Benefit Analysis	28	79	2.82	0.98	1
Forecasting: Regression Analysis	28	61	2.17	1.02	3
Linear Programming	28	49	1.75	0.75	5
Simulation Models	28	48	1.71	0.76	6
Statistic: Significance Testing	28	47	1.74	0.85	7
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	61	2.17	1.09	4

Table 35
Differences in the Extent of Use in Planning using Management Techniques by Category and Level of Administrators
N=160

Source*	DF	Seq SS	Adj SS	Adj MS	F	p
Category	1	0.491	0.463	0.463	2.30	.13
Levels	1	0.0002	0.0002	0.0002	0.00	.97
Error	157	31.655	31.655	.201		
Total	159	32.147				

Seq=Sequential sum of squares (each term is fit after all other terms in the model)

Adj=Adjusted sum of squares.

Management techniques refer to qualitative and quantitative techniques

* Category refers to type of administrators (nonacademic and academic)

* Levels refer to the two levels of administrators (executive and operative)

Extent of Use in Directing

Table 36 presents the total number of responses related to the extent of use of qualitative and quantitative techniques in directing activities. This table details that Checklists and Brainstorming are the qualitative techniques more frequently used in the directing functions, and Benchmarking and Cost-Benefit Analysis are the quantitative techniques used more frequently in directing functions in the organizations surveyed.

Checklists ranked in first place among the qualitative techniques. This technique reported the highest aggregated score on the extent of use of qualitative techniques in directing activities. Specifically, 45 of the 154 respondents indicated that they “always use” this technique in directing tasks, and 69 of 154 of them reported that they “frequently use” this technique in such activities. In regard to Brainstorming, 27 of 150 respondents pointed out that they “always use” it in directing tasks, and 65 of 150 of them indicated that they “frequently use” it in directing tasks.

On the other hand, this table also shows that 28 of 153 respondents “always use” Cost-Benefit in directing activities and 56 of 153 of them “frequently use” it in directing. Similarly, 15 of 152 respondents indicated that they “always use” Benchmarking in directing tasks, and 52 of 152 of them “frequently use” it in directing functions.

Table 36
Number of Responses Related to the Extent of Use of Qualitative and Quantitative
 Techniques in Directing Activities (All Respondents)

TECHNIQUES	Extent of Use in Directing *				
	Total Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	150	15	43	65	27
Checklists	154	16	24	69	45
Job Enrichment/Enhancement	144	36	48	49	14
Management by Objectives (MBO)	155	25	42	62	26
Management Information System (MIS)	151	48	46	44	13
Nominal Group Technique	147	107	28	10	2
Theory X & Y	146	97	34	10	5
QUANTITATIVE					
Benchmarking	152	17	68	52	15
Cost-Benefit Analysis	153	22	47	56	28
Forecasting: Regression Analysis	152	72	52	22	6
Linear Programming	152	100	39	10	3
Simulation Models	112	86	10	15	1
Statistic: Significance Testing	148	91	39	16	2
TQM: Cause-Effect Analysis (Fishbone Diagram)	148	70	49	25	4

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 37 summarizes the aggregated score, means, standard deviation, and ranking of total responses related to the extent of use of qualitative and quantitative techniques in directing activities. It can be noted that Checklists and Brainstorming are the qualitative techniques more often used in directing activities, and Cost-Benefit Analysis is the quantitative technique more used in directing functions.

Table 38 shows the number of responses from the nonacademic executive group related to the extent of use of qualitative and quantitative techniques in directing activities. This table shows that Checklists and Management by Objectives are the qualitative techniques more frequently used by this group, and Cost-Benefit Analysis and Benchmarking are the quantitative techniques more often used by this group in directing activities.

Specifically, 12 of 30 respondents indicated that they “always use” Checklists in their directing activities, and 12 of 30 of them “frequently use” it in such activities. Similarly, 5 of 29 respondents indicated that they “always use” Management by Objectives in directing tasks, and 15 of 29 of them “frequently use” it in directing tasks.

On the other hand, 10 of 29 respondents indicated that they “always use” Cost-Benefit Analysis in directing activities, and 13 of 29 of them “frequently use” it in directing. Similarly, 4 of 28 of them indicated that they “always use” Benchmarking in directing functions, and 12 of 29 of them “frequently use” it in directing.

Table 37
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses on the Extent of Use of Qualitative and Quantitative Techniques in Directing Activities (All Respondents)

TECHNIQUES	Extent of Use in Directing*				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	150	404	2.69	0.88	2
Checklists	154	451	2.92	0.92	1
Job Enrichment/Enhancement	147	335	2.27	0.94	4
Management by Objectives (MBO)	155	399	2.57	0.95	3
Management Information System (MIS)	151	324	2.14	0.96	5
Nominal Group Technique	147	201	1.36	0.67	7
Theory X & Y	146	215	1.47	0.77	6
QUANTITATIVE					
Benchmarking	152	369	2.42	0.81	2
Cost-Benefit Analysis	153	396	2.58	0.94	1
Forecasting: Regression Analysis	152	266	1.75	0.84	3
Linear Programming	152	220	1.44	0.70	6
Simulation Models	112	155	1.38	0.75	7
Statistic: Significance Testing	148	225	1.52	0.74	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	148	259	1.75	0.83	4

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 38
Number of Responses from the Nonacademic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Directing Activities

TECHNIQUES	Extent of Use in Directing *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	30	4	10	8	8
Checklists	30	4	2	12	12
Job Enrichment/Enhancement	29	8	6	10	5
Management by Objectives (MBO)	29	4	5	15	5
Management Information System (MIS)	29	8	9	11	1
Nominal Group Technique	28	19	5	3	1
Theory X & Y	28	17	8	2	1
QUANTITATIVE					
Benchmarking	28	2	10	12	4
Cost-Benefit Analysis	29	4	2	13	10
Forecasting: Regression Analysis	30	14	11	3	2
Linear Programming	29	19	6	4	0
Simulation Models	29	16	8	5	0
Statistic: Significance Testing	28	20	4	4	0
TQM: Cause-Effect Analysis (Fishbone Diagram)	29	14	9	6	0

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 39 summarizes the aggregated score, mean, standard deviation and ranking of responses from the nonacademic executive group related to extent of use of qualitative and quantitative techniques in directing activities.

Table 40 shows the number of responses from the nonacademic operative group related to extent of use of qualitative and quantitative techniques in directing activities. In this group, it can be noted that 16 of 70 respondents indicated that they “always use” Checklists in directing activities, and 37 of 70 “frequently use” it in directing tasks. Similarly, 6 of 67 respondents indicated that they “always use” Brainstorming in directing tasks, and 34 of 67 “frequently use” it in directing.

On the other hand, 5 of 69 respondents indicated that they “always use” Benchmarking in directing tasks, and 26 of 69 of them “frequently use” it in directing. Similarly, 6 of 69 respondents indicated that they “always use” Cost-Benefit Analysis in directing activities, and 26 of 69 “frequently use” it in directing.

Table 41 summarizes the aggregated score, mean, standard deviation and ranking of responses from the nonacademic operative group related to the extent of use of qualitative and quantitative techniques in directing activities. This table reinforces the findings of table 40, that Checklists and Brainstorming are the more frequently used qualitative techniques by the nonacademic operative group in directing activities, and Benchmarking and Cost-Benefit Analysis are the quantitative techniques more frequently used by this group in directing tasks.

Table 39
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Nonacademic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Directing Activities

TECHNIQUES	Extent of Use in Directing				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	30	80	2.66	1.02	3
Checklists	30	92	3.06	1.01	1
Job Enrichment/Enhancement	29	70	2.41	1.08	4
Management by Objectives (MBO)	29	79	2.72	0.92	2
Management Information System (MIS)	29	63	2.17	0.88	5
Nominal Group Technique	28	42	1.50	0.83	7
Theory X & Y	28	43	1.53	0.79	6
QUANTITATIVE					
Benchmarking	28	74	2.64	0.83	2
Cost-Benefit Analysis	29	87	3.00	1.00	1
Forecasting: Regression Analysis	30	53	1.76	0.89	3
Linear Programming	29	43	1.48	0.73	6
Simulation Models	29	47	1.62	0.77	5
Statistic: Significance Testing	28	40	1.42	0.74	7
TQM: Cause-Effect Analysis (Fishbone Diagram)	29	50	1.72	0.79	4

Table 40
Number of Responses from the Nonacademic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Directing Activities

TECHNIQUES	Extent of Use in Directing *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	67	7	20	34	6
Checklists	70	6	11	37	16
Job Enrichment/Enhancement	67	15	25	24	3
Management by Objectives (MBO)	68	8	25	26	9
Management Information System (MIS)	69	19	24	18	8
Nominal Group Technique	66	50	14	2	0
Theory X & Y	65	51	11	2	1
QUANTITATIVE					
Benchmarking	69	4	34	26	5
Cost-Benefit Analysis	69	8	29	26	6
Forecasting: Regression Analysis	67	28	26	11	2
Linear Programming	68	47	17	3	1
Simulation Models	68	37	28	3	0
Statistic: Significance Testing	66	37	22	6	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	67	28	31	6	2

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 41
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Nonacademic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Directing Activities

TECHNIQUES	Extent of Use in Directing				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	67	173	2.58	0.80	2
Checklists	70	203	2.90	0.85	1
Job Enrichment/Enhancement	67	149	2.22	0.84	4
Management by Objectives (MBO)	68	172	2.52	0.87	3
Management Information System (MIS)	69	153	2.21	0.98	5
Nominal Group Technique	66	84	1.27	0.51	6
Theory X & Y	65	83	1.27	0.59	7
QUANTITATIVE					
Benchmarking	69	170	2.46	0.71	1
Cost-Benefit Analysis	69	168	2.43	0.81	2
Forecasting: Regression Analysis	67	121	1.80	0.82	3
Linear Programming	68	94	1.38	0.64	7
Simulation Models	68	102	1.50	0.58	6
Statistic: Significance Testing	66	103	1.56	0.72	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	67	116	1.73	0.75	4

Table 42 shows the number of responses from the academic executive group related to the extent of use of qualitative and quantitative techniques in directing activities. This table shows that 10 of 28 respondents indicated they “always use” Checklists in directing activities, and 10 of 28 “frequently use” it in directing tasks. Similarly, 5 of 27 respondents indicated they “always use” Brainstorming in directing activities, and 13 of 27 “frequently use” it in directing tasks.

On the other hand, 2 of 27 respondents indicated they “always use” Benchmarking in directing functions, and 7 of 27 “frequently use” it in directing. Similarly, 7 of 27 respondents indicated they “always use” Cost-Benefit analysis in directing tasks, and 6 of 27 “frequently use” it in directing functions.

Table 43 summarizes the aggregated score, mean, standard deviation and ranking of responses from the academic executive group related to the extent of use of qualitative and quantitative techniques in directing activities. This table reinforces the findings of table 42, that Checklists and Brainstorming are the more frequently used qualitative techniques by the academic executive group in directing activities, and Cost-Benefit Analysis and Benchmarking are the quantitative techniques more often used by this group in directing tasks. It also is important to note that Simulation technique presents a better rank order for this group than for the other studied groups. This may suggest that this type of administrator may have more preference

Table 42
Number of Responses from the Academic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Directing Activities

TECHNIQUES	Extent of Use in Directing *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	27	1	8	13	5
Checklists	28	2	6	10	10
Job Enrichment/Enhancement	27	7	9	8	3
Management by Objectives (MBO)	30	4	9	9	8
Management Information System (MIS)	27	8	9	8	2
Nominal Group Technique	27	19	5	3	0
Theory X & Y	27	15	7	4	1
QUANTITATIVE					
Benchmarking	27	5	13	7	2
Cost-Benefit Analysis	27	5	9	6	7
Forecasting: Regression Analysis	27	16	9	2	0
Linear Programming	27	19	6	0	2
Simulation Models	27	16	8	2	1
Statistic: Significance Testing	27	18	8	1	0
TQM: Cause-Effect Analysis (Fishbone Diagram)	24	17	4	3	0

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 43
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Academic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Directing Activities

TECHNIQUES	Extent of Use in Directing				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	27	76	2.81	0.78	2
Checklists	28	84	3.00	0.94	1
Job Enrichment/Enhancement	27	61	2.25	0.98	4
Management by Objectives (MBO)	30	81	2.70	1.02	3
Management Information System (MIS)	27	58	2.14	0.94	5
Nominal Group Technique	27	38	1.40	0.69	7
Theory X & Y	27	45	1.66	0.87	6
QUANTITATIVE					
Benchmarking	27	60	2.22	0.84	2
Cost-Benefit Analysis	27	69	2.55	1.08	1
Forecasting: Regression Analysis	27	40	1.48	0.64	4
Linear Programming	27	39	1.44	0.84	5
Simulation Models	27	42	1.55	0.80	3
Statistic: Significance Testing	27	37	1.37	0.56	7
TQM: Cause-Effect Analysis (Fishbone Diagram)	24	34	1.41	0.71	6

for the use of this technique in directing activities.

Table 44 presents the number of responses from the academic operative group related to the extent of use of qualitative and quantitative techniques in directing activities. In this group, 8 of 26 respondents indicated that they “always use” Brainstorming in directing tasks, and 10 of 26 of them reported that they “frequently use” Brainstorming in directing functions. Similarly, 7 of 26 respondents indicated that they “always use” Checklists in directing activities, and 10 of 26 indicated that they “frequently use” Checklists in directing tasks.

On the other hand, 4 of 28 respondents indicated that they “always use” Benchmarking in directing tasks, and 7 of 28 “frequently use” it in directing. Similarly, 5 of 28 respondents reported that they “always use” Cost-Benefit Analysis in directing functions and 11 of 28 “frequently use” it in directing.

Table 45 summarizes the aggregated score, mean, standard deviation and ranking of the responses from the academic operative group related to the extent of use of qualitative and quantitative techniques in directing activities. A relevant change in the rank order of TQM (Cause-Effect Analysis), of the quantitative techniques, can be noted in this table. This group ranked TQM in third place, suggesting it has a higher preference for this technique in directing functions than the other groups.

Table 44
Number of Responses from the Academic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Directing Activities

TECHNIQUES	Extent of Use in Directing *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	26	3	5	10	8
Checklists	26	4	5	10	7
Job Enrichment/Enhancement	24	6	8	7	3
Management by Objectives (MBO)	28	9	3	12	4
Management Information System (MIS)	26	13	4	7	2
Nominal Group Technique	26	19	4	2	1
Theory X & Y	26	14	8	2	2
QUANTITATIVE					
Benchmarking	28	6	11	7	4
Cost-Benefit Analysis	28	5	7	11	5
Forecasting: Regression Analysis	28	14	6	6	2
Linear Programming	28	15	10	3	0
Simulation Models	28	17	6	5	0
Statistic: Significance Testing	27	16	5	5	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	11	5	10	2

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 45
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from Academic
 Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques
 in Directing Activities

TECHNIQUES	Extent of Use in Directing				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	26	75	2.88	0.99	1
Checklists	26	72	2.76	1.03	2
Job Enrichment/Enhancement	24	55	2.29	0.99	4
Management by Objectives (MBO)	28	67	2.39	1.10	3
Management Information System (MIS)	26	50	1.92	1.05	5
Nominal Group Technique	26	37	1.42	0.80	7
Theory X & Y	26	44	1.69	0.92	6
QUANTITATIVE					
Benchmarking	28	65	2.32	0.98	2
Cost-Benefit Analysis	28	72	2.57	0.99	1
Forecasting: Regression Analysis	28	52	1.85	1.00	4
Linear Programming	28	44	1.57	0.69	6
Simulation Models	28	44	1.57	0.79	7
Statistic: Significance Testing	27	45	1.66	0.91	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	59	2.10	1.03	3

Table 46 details the results of testing differences on the extent of use in directing with management techniques by category (nonacademic and academic), and by level (executive and operative) of administrators. In this table, it can be identified that there is no statistical significance between group differences by category (nonacademic and academic), and by levels (executive and operative). It can be concluded that differences between factors observed among the groups did not depend upon the category and level for the extent of use in directing by the respondents.

Extent of Use in Reporting

Table 47 displays the number of responses related to the extent of use of qualitative and quantitative techniques in reporting activities. This table shows that the frequency of responses related to the descriptor numbered as 4 (always use) is very low, with the exception of the Checklists technique that presents a total of 34 responses having the highest mean rank for this administrative activity. In all, the response data shows a range from a “frequently to occasionally” use of the techniques in reporting activities. However, 34 of 134 respondents indicated that they “always use” Checklists in reporting activities, and 58 of 134 reported that they “frequently use” checklists in reporting. Similarly, 14 of 153 respondents indicated that they “always use” Management by Objectives in reporting activities, and 63 of 153 indicated that they “frequently use” this technique in reporting.

Table 46
Differences on the Extent of Use in Directing Activities using Management Techniques
by Category and Level of Administrators
N=160

Source*	DF	Seq SS	Adj SS	Adj MS	F	p
Category	1	0.024	0.050	0.050	0.21	.64
Levels	1	0.110	0.110	0.110	0.46	.49
Error	157	37.560	37.560	0.239		
Total	159	37.694				

Seq=Sequential sum of squares (each term is fit after all other terms in the model)

Adj=Adjusted sum of squares.

Management techniques refer to qualitative and quantitative techniques

* Category refers to type of administrators (nonacademic and academic)

* Levels refer to the two levels of administrators (executive and operative)

Table 47
Number of Responses Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities (All Respondents)

TECHNIQUES	Extent of Use in Reporting *				
	Total Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	152	44	57	32	19
Checklists	134	2	40	58	34
Job Enrichment/Enhancement	146	54	46	40	6
Management by Objectives (MBO)	153	46	30	63	14
Management Information System (MIS)	148	62	23	45	18
Nominal Group Technique	151	119	24	8	0
Theory X & Y	145	109	23	11	2
QUANTITATIVE					
Benchmarking	152	10	36	80	26
Cost-Benefit Analysis	153	17	32	77	27
Forecasting: Regression Analysis	152	63	45	36	8
Linear Programming	152	101	32	17	2
Simulation Models	150	83	49	17	1
Statistic: Significance Testing	149	80	45	20	4
TQM: Cause-Effect Analysis (Fishbone Diagram)	156	69	46	36	5

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

On the other hand, 26 of 152 respondents indicated that they “always use” Benchmarking in reporting activities, and 80 of 152 reported that they “frequently use” it in reporting activities. Similarly, 27 of 153 respondents indicated that they “always use” Cost-Benefit Analysis in reporting tasks, and 77 of 153 reported that they “frequently use” it in reporting functions.

Tables 48 summarizes the aggregated score, means, standard deviation, and ranking of responses related to the extent of use of qualitative and quantitative techniques in reporting activities. It can be noted that Checklists and Management by Objectives are the qualitative techniques more often used by the respondents in reporting activities, and Benchmarking and Cost-Benefit Analysis are the quantitative techniques more often used by the respondents in reporting.

Tables 49 to 55 present the number of responses, the aggregated scores, and ranking of responses from the diverse groups studied in relation to the extent of use of qualitative and quantitative techniques in reporting activities. In these eight tables, it can be observed that Checklists and Benchmarking have the most frequent use in reporting, and Nominal Group Technique and Forecasting are the less frequently used qualitative and quantitative techniques in reporting.

Table 49 shows the number of responses from the nonacademic executive group related to the extent of use of qualitative and quantitative techniques in reporting activities. This table details that Checklists and

Table 48
Aggregated Score, Mean, Standard Deviation and Ranking of Responses Related to the
 Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting *				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	152	330	2.17	0.98	3
Checklists	134	392	2.92	0.78	1
Job Enrichment/Enhancement	146	290	1.98	0.90	5
Management by Objectives (MBO)	153	351	2.29	0.99	2
Management Information System (MIS)	148	315	2.12	1.09	4
Nominal Group Technique	151	191	1.26	0.55	7
Theory X & Y	145	196	1.35	0.68	6
QUANTITATIVE					
Benchmarking	152	426	2.80	0.79	1
Cost-Benefit Analysis	153	420	2.74	0.87	2
Forecasting: Regression Analysis	152	293	1.92	0.92	3
Linear Programming	152	224	1.47	0.74	7
Simulation Models	150	236	1.57	0.71	6
Statistic: Significance Testing	149	246	1.65	0.81	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	156	289	1.85	0.88	4

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 49
Number of Responses from the Nonacademic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	29	11	9	5	4
Checklists	29	8	3	11	7
Job Enrichment/Enhancement	27	13	5	7	2
Management by Objectives (MBO)	28	9	2	14	3
Management Information System (MIS)	28	8	3	17	0
Nominal Group Technique	28	23	4	1	0
Theory X & Y	28	23	4	1	0
QUANTITATIVE					
Benchmarking	29	1	3	20	5
Cost-Benefit Analysis	28	1	1	19	7
Forecasting: Regression Analysis	28	8	10	9	1
Linear Programming	30	19	7	4	0
Simulation Models	29	16	9	4	0
Statistic: Significance Testing	28	14	10	3	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	29	13	10	6	0

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Management by Objectives are the qualitative techniques more often used, and Cost-Benefit Analysis and Benchmarking are the quantitative techniques more often used by this group in reporting activities.

Specifically, 7 of 29 respondents indicated that they “always use” Checklists in their reporting activities, and 11 of 29 “frequently use” it in such activities. Similarly, 3 of 28 respondents indicated that they “always use” Management by Objectives in reporting tasks, and 14 of 28 “frequently use” it in directing tasks. On the other hand, 7 of 28 respondents indicated that they “always use” Cost-Benefit Analysis in reporting activities, and 19 of 28 “frequently use” it in reporting. Similarly, 5 of 29 indicated that they “always use” Benchmarking in reporting functions, and 20 of 29 “frequently use” it in reporting.

Table 50 summarizes the aggregated score, mean, standard deviation and ranking of responses from the nonacademic executive group related to the extent of use of qualitative and quantitative techniques in reporting activities. It can be noted that Checklists and Management by Objectives are the qualitative techniques more frequently used by this group in reporting tasks, and Cost-Benefit Analysis and Benchmarking are the quantitative techniques more often used by this group in reporting activities. On the contrary, Theory X & Y and Nominal Group Technique are the qualitative techniques less frequently used by this group in reporting activities, and Simulation Models and Linear Programming are the quantitative techniques less frequently used by this group in reporting tasks.

Table 50
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Nonacademic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	29	60	2.06	1.06	4
Checklists	29	75	2.58	1.15	1
Job Enrichment/Enhancement	27	52	1.92	1.03	5
Management by Objectives (MBO)	28	67	2.39	1.06	2
Management Information System (MIS)	28	65	2.32	0.90	3
Nominal Group Technique	28	34	1.21	0.49	6
Theory X & Y	28	34	1.21	0.49	6
QUANTITATIVE					
Benchmarking	29	87	3.00	0.65	2
Cost-Benefit Analysis	28	88	3.14	0.65	1
Forecasting: Regression Analysis	28	59	2.10	0.87	3
Linear Programming	30	45	1.50	0.73	7
Simulation Models	29	46	1.58	0.73	6
Statistic: Significance Testing	28	47	1.67	0.81	5
TQM : Cause-Effect Analysis (Fishbone Diagram)	29	51	1.75	0.78	4

Table 51 shows the number of responses from the nonacademic operative group related to the extent of use of qualitative and quantitative techniques in reporting activities. In this group, it can be noted that 15 of 70 respondents indicated that they “always use” Checklists in reporting activities, and 27 of 70 responded that they “frequently use” it in reporting tasks. Similarly, 11 of 70 respondents indicated that they “always use” Management Information System in reporting tasks, and 25 of 70 “frequently use” it in reporting.

On the other hand, 14 of 69 respondents indicated that they “always use” Benchmarking in reporting tasks, and 31 of 69 of them “frequently use” it in reporting. Similarly, 10 of 68 respondents indicated that they “always use” Cost-Benefit Analysis in reporting activities, and 32 of 68 of them “frequently use” it in reporting.

Table 52 summarizes the aggregated score, mean, standard deviation and ranking of responses from the nonacademic operative group related to the extent of use of qualitative and quantitative techniques in reporting activities. This table reinforces the results found in table 51, that Checklists and Management Information System are the more frequently used qualitative techniques by the nonacademic operative group in reporting activities, and Benchmarking and Cost-Benefit Analysis are the quantitative techniques more frequently used by this group in reporting tasks.

Table 51
Number of Responses from the Nonacademic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting *				
	Number	1	2	3	4
QUALITATIVE					
Brainstorming	69	18	30	13	8
Checklists	70	6	22	27	15
Job Enrichment/Enhancement	65	21	23	21	0
Management by Objectives (MBO)	69	18	18	26	7
Management Information System (MIS)	70	23	11	25	11
Nominal Group Technique	68	54	14	0	0
Theory X & Y	66	53	9	4	0
QUANTITATIVE					
Benchmarking	69	2	22	31	14
Cost-Benefit Analysis	68	4	22	32	10
Forecasting: Regression Analysis	71	26	24	15	6
Linear Programming	68	45	14	8	1
Simulation Models	68	33	30	4	1
Statistic: Significance Testing	68	37	22	8	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	67	28	19	15	5

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 52
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Nonacademic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	69	149	2.15	0.94	4
Checklists	70	191	2.72	0.89	1
Job Enrichment/Enhancement	65	130	2.00	0.81	5
Management by Objectives (MBO)	69	160	2.31	0.97	3
Management Information System (MIS)	70	164	2.34	1.10	2
Nominal Group Technique	68	81	1.20	0.40	7
Theory X & Y	66	83	1.25	0.56	6
QUANTITATIVE					
Benchmarking	69	195	2.82	0.78	1
Cost-Benefit Analysis	68	184	2.70	0.79	2
Forecasting: Regression Analysis	71	143	2.01	0.96	4
Linear Programming	68	101	1.48	0.76	7
Simulation Models	68	109	1.60	0.67	5
Statistic: Significance Testing	68	109	1.60	0.75	6
TQM: Cause-Effect Analysis (Fishbone Diagram)	67	131	2.10	1.46	3

Table 53 shows the number of responses from the academic executive group related to the extent of use of qualitative and quantitative techniques in reporting activities. This table shows that 7 of 27 respondents indicated they “always use” Checklists in reporting activities, and 11 of 27 “frequently use” it in reporting tasks. Similarly, 5 of 26 respondents indicated they “always use” Brainstorming in reporting activities and 6 of 26 “frequently use” it in reporting tasks.

On the other hand, 3 of 27 respondents indicated they “always use” Cost-Benefit Analysis in reporting functions, and 15 of 27 “frequently use” it in reporting. Two (2) of 27 respondents indicated they “always use” Benchmarking in reporting tasks, and 13 of 27 “frequently use” it in reporting functions.

Table 54 summarizes the aggregated score, mean, standard deviation and ranking of responses from the academic executive group related to the extent of use of qualitative and quantitative techniques in reporting activities. This table reinforces the findings of table 53, that Checklists and Brainstorming are the most frequently used qualitative techniques by the academic executive group in reporting activities, and Cost-Benefit Analysis and Benchmarking are the quantitative techniques more frequently used by this group in reporting tasks. It also is important to note that Nominal Group Technique and Linear Programming are the less frequently used techniques by this group in this activity.

Table 53
Number of Responses from the Academic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	26	5	10	6	5
Checklists	27	1	8	11	7
Job Enrichment/Enhancement	27	9	9	6	3
Management by Objectives (MBO)	28	7	8	11	2
Management Information System (MIS)	26	14	7	1	4
Nominal Group Technique	27	21	3	3	0
Theory X & Y	26	19	5	0	2
QUANTITATIVE					
Benchmarking	27	4	8	13	2
Cost-Benefit Analysis	27	2	7	15	3
Forecasting: Regression Analysis	26	16	6	4	0
Linear Programming	26	19	3	3	1
Simulation Models	26	17	5	4	0
Statistic: Significance Testing	26	14	9	2	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	23	16	3	4	0

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 54
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Academic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	26	63	2.42	1.02	2
Checklists	27	78	2.88	0.84	1
Job Enrichment/Enhancement	27	57	2.11	1.01	4
Management by Objectives (MBO)	28	64	2.28	0.93	3
Management Information System (MIS)	26	47	1.80	1.09	5
Nominal Group Technique	27	36	1.33	0.67	7
Theory X & Y	26	37	1.42	0.85	6
QUANTITATIVE					
Benchmarking	27	67	2.48	0.84	2
Cost-Benefit Analysis	27	73	2.70	0.77	1
Forecasting: Regression Analysis	26	40	1.53	0.76	4
Linear Programming	26	38	1.46	0.85	7
Simulation Models	26	39	1.50	0.76	5
Statistic: Significance Testing	26	42	1.61	0.80	3
TQM: Cause-Effect Analysis (Fishbone Diagram)	23	34	1.47	0.79	6

Table 55 displays the number of responses from the academic operative group related to the extent of use of qualitative and quantitative techniques in reporting activities. In this table, there are 5 of 28 respondents who “always use” Checklists in reporting activities, and 9 of 28 who “frequently use” it in reporting. In regards to Management by Objectives, there are 2 of 28 respondents who “always use” this technique, and 12 of 28 who “frequently use” it in reporting tasks.

Similarly, in this group there are 5 of 27 respondents who “always use” Benchmarking in reporting tasks, and 16 of 27 who “frequently use” it in reporting activities. With regard to Cost-Benefit Analysis, there are 7 of 27 respondents who “always use” this technique in reporting, and 11 of 27 who “frequently use” it in reporting.

Table 56 details the aggregated score, mean, standard deviation and ranking of responses from the academic operative group related to the extent of use of qualitative and quantitative techniques in reporting activities. It can be noted that Checklists and Management by Objectives are the qualitative techniques more frequently used by this group, and Benchmarking and Cost-Benefit Analysis are the quantitative techniques more frequently used by this group.

Table 55
Number of Responses from the Academic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	28	10	8	8	2
Checklists	28	7	7	9	5
Job Enrichment/Enhancement	27	11	9	6	1
Management by Objectives (MBO)	28	12	2	12	2
Management Information System (MIS)	28	17	2	6	3
Nominal Group Technique	28	21	3	4	0
Theory X & Y	25	14	5	6	0
QUANTITATIVE					
Benchmarking	27	3	3	16	5
Cost-Benefit Analysis	27	7	2	11	7
Forecasting: Regression Analysis	27	13	5	8	1
Linear Programming	27	17	8	2	0
Simulation Models	27	17	5	5	0
Statistic: Significance Testing	27	15	4	7	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	27	12	4	11	0

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 56
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Academic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Reporting Activities

TECHNIQUES	Extent of Use in Reporting				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	28	58	2.07	0.97	3
Checklists	28	68	2.42	1.06	1
Job Enrichment/Enhancement	27	51	1.88	0.89	4
Management by Objectives (MBO)	28	60	2.14	1.07	2
Management Information System (MIS)	28	51	1.82	1.12	5
Nominal Group Technique	28	39	1.39	0.73	7
Theory X & Y	25	42	1.68	0.85	6
QUANTITATIVE					
Benchmarking	27	77	2.85	0.86	1
Cost-Benefit Analysis	27	72	2.66	1.14	2
Forecasting: Regression Analysis	27	51	1.88	0.97	4
Linear Programming	27	39	1.44	0.64	7
Simulation Models	27	42	1.55	0.80	6
Statistic: Significance Testing	27	48	1.77	0.97	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	27	53	1.96	0.93	3

Table 57 summarizes the results of the analysis of the differences in the extent of use in reporting using management techniques by category and by levels of administrator. It can be observed that there are no statistical differences in the extent of use of various management techniques in reporting, either by level or type of administrators (executive and operative levels), or by category of administrators (nonacademic and academic).

Extent of Use in Controlling

Table 58 shows the total number of responses related to the extent of use of qualitative and quantitative techniques in controlling activities. It can be observed that the majority of the techniques are frequently and occasionally used in controlling activities. However, there are 34 of 151 respondents who indicated that they “always use” Checklists in controlling activities, and 24 of 151 who reported that they “always use” Brainstorming in controlling tasks. Similarly, there are 38 of 154 respondents who reported they “always use” Cost-Benefit Analysis in controlling, and 33 of 153 who indicated that they “always use” Benchmarking in controlling activities.

Tables 59 to 66 summarize number, aggregated scores, and ranking of the responses related to the extent of use in controlling tasks for the four groups studied by category and by level. As these tables show, there are no significant changes in rank order related to the classification and frequency and Linear Programming are the quantitative techniques less frequently used by this group in reporting tasks.

Table 57
Differences on the Extent of Use in Reporting using Management Techniques by
Category and by Level of Administrators
N=160

Source*	DF	Seq SS	Adj SS	Adj MS	F	p
Category	1	0.223	0.183	0.183	0.56	.45
Levels	1	0.022	0.022	0.022	0.07	.79
Error	157	51.366	51.366	0.327		
Total	159	51.612				

Seq=Sequential sum of squares (each term is fit after all other terms in the model)

Adj=Adjusted sum of squares.

Management techniques refer to qualitative and quantitative techniques

* Category refers to type of administrators (nonacademic and academic)

* Levels refer to the two levels of administrators (executive and operative)

Table 58
Number of Responses Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities (All Respondents)

TECHNIQUES	Extent of Use in Controlling *				
	Total Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	151	23	44	60	24
Checklists	151	12	26	79	34
Job Enrichment/Enhancement	144	45	37	45	17
Management by Objectives (MBO)	150	30	33	61	26
Management Information System (MIS)	148	48	28	53	19
Nominal Group Technique	151	103	36	12	0
Theory X & Y	146	92	38	13	3
QUANTITATIVE					
Benchmarking	153	12	37	71	33
Cost-Benefit Analysis	154	19	29	68	38
Forecasting: Regression Analysis	152	67	41	32	12
Linear Programming	150	90	37	16	7
Simulation Models	155	78	46	30	1
Statistic: Significance Testing	152	70	47	32	3
TQM: Cause-Effect Analysis (Fishbone Diagram)	151	61	26	59	5

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 59 summarizes the aggregated score, mean, standard deviation, and ranking of responses from the nonacademic executive group related to extent of use of qualitative and quantitative techniques in controlling activities. It can be noted that Checklists and Brainstorming are the qualitative techniques more frequently used in controlling activities, and Benchmarking and Cost-Benefit Analysis are the quantitative techniques more frequently used in controlling activities. In this table, Nominal Group Technique and Linear Programming occupied the last place in ranking. This suggests that such managerial techniques are less frequently used by the respondents in controlling activities.

Table 60 shows the number of responses from the nonacademic executive group related to the extent of use of qualitative and quantitative techniques in controlling activities. This table shows that Checklists and Management by Objectives are the qualitative techniques more frequently used, and Cost-Benefit Analysis and Benchmarking are the quantitative techniques more frequently used by this group in controlling activities. Specifically, 8 of 27 respondents indicated that they “always use” Checklists in their controlling activities, and 15 of 27 “frequently use” it in such activities. Similarly, 4 of 29 respondents indicated that they “always use” Management by Objectives in controlling tasks, and 18 of 29 of them “frequently use” it in controlling tasks.

Table 59
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities (All Respondents)

TECHNIQUES	Extent of Use in Controlling*				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	151	387	2.56	0.93	2
Checklists	151	437	2.89	0.84	1
Job Enrichment/Enhancement	144	322	2.23	1.02	5
Management by Objectives (MBO)	150	383	2.55	1.00	3
Management Information System (MIS)	148	339	2.29	1.05	4
Nominal Group Technique	151	211	1.39	0.63	7
Theory X & Y	146	219	1.50	0.74	6
QUANTITATIVE					
Benchmarking	153	431	2.81	0.86	1
Cost-Benefit Analysis	154	433	2.81	0.94	2
Forecasting: Regression Analysis	152	293	1.92	0.98	4
Linear Programming	150	240	1.60	0.85	7
Simulation Models	155	264	1.70	0.79	6
Statistic: Significance Testing	152	269	1.78	0.84	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	151	310	2.05	0.96	3

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

Table 60
Number of Responses from the Nonacademic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities

TECHNIQUES	Extent of Use in Controlling *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	30	5	10	9	6
Checklists	29	4	2	15	8
Job Enrichment/Enhancement	29	8	8	8	5
Management by Objectives (MBO)	29	4	3	18	4
Management Information System (MIS)	29	5	4	18	2
Nominal Group Technique	30	21	6	3	0
Theory X & Y	29	17	9	2	1
QUANTITATIVE					
Benchmarking	27	2	6	14	5
Cost-Benefit Analysis	28	2	3	14	9
Forecasting: Regression Analysis	27	12	7	7	1
Linear Programming	29	17	6	5	1
Simulation Models	29	16	9	4	0
Statistic: Significance Testing	28	16	5	5	2
TQM: Cause-Effect Analysis (Fishbone Diagram)	29	14	3	11	1

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

On the other hand, 9 of 28 respondents indicated that they “always use” Cost-Benefit Analysis in controlling activities, and 14 of 28 of them “frequently use” it in controlling. Similarly, 5 of 27 of them indicated that they “always use” Benchmarking in controlling functions, and 14 of 27 of them “frequently use” it in controlling.

Table 61 summarizes the aggregated score, mean, standard deviation and ranking of responses from the nonacademic executive group related to the extent of use of qualitative and quantitative techniques in controlling activities. It can be noted that Checklists and Management by Objectives are the qualitative techniques more frequently used in controlling activities, and Cost-Benefit Analysis and Benchmarking are the quantitative techniques more frequently used by this group in controlling activities.

Table 62 shows the number of responses from the nonacademic operative group related to the extent of use of qualitative and quantitative techniques in controlling activities. In this table, it can be noted that 14 of 68 respondents indicated that they “always use” Checklists in controlling activities, and 39 of 68 of them “frequently use” it in controlling tasks. Similarly, 13 of 67 respondents indicated that they “always use” Management by Objectives in controlling tasks, and 23 of 67 of them “frequently use” it in controlling.

Table 61
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Nonacademic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities

TECHNIQUES	Extent of Use in Controlling				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	30	76	2.53	1.00	4
Checklists	29	85	2.93	0.96	1
Job Enrichment/Enhancement	29	68	2.34	1.07	5
Management by Objectives (MBO)	29	80	2.75	0.87	2
Management Information System (MIS)	29	75	2.58	0.86	3
Nominal Group Technique	30	42	1.40	0.67	7
Theory X & Y	29	45	1.55	0.78	6
QUANTITATIVE					
Benchmarking	27	76	2.81	0.83	2
Cost-Benefit Analysis	28	86	3.07	0.85	1
Forecasting: Regression Analysis	27	51	1.88	0.93	4
Linear Programming	29	48	1.65	0.89	6
Simulation Models	29	46	1.58	0.73	7
Statistic: Significance Testing	28	49	1.75	1.00	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	29	57	1.96	1.01	3

Table 62
Number of Responses from the Nonacademic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities

TECHNIQUES	Extent of Use in Controlling *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	67	8	14	33	12
Checklists	68	3	12	39	14
Job Enrichment/Enhancement	62	18	17	21	6
Management by Objectives (MBO)	67	11	20	23	13
Management Information System (MIS)	66	17	16	24	9
Nominal Group Technique	67	43	22	2	0
Theory X & Y	66	45	13	6	2
QUANTITATIVE					
Benchmarking	70	4	16	32	18
Cost-Benefit Analysis	70	8	14	31	17
Forecasting: Regression Analysis	70	25	20	15	10
Linear Programming	68	39	15	9	5
Simulation Models	68	27	27	13	1
Statistic: Significance Testing	68	27	25	16	0
TQM: Cause-Effect Analysis (Fishbone Diagram)	69	21	16	28	4

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

On the other hand, 18 of 70 respondents indicated that they “always use” Benchmarking in controlling tasks, and 32 of 70 of them “frequently use” it in controlling. Similarly, 17 of 70 respondents indicated that they “always use” Cost-Benefit Analysis in controlling activities, and 31 of 70 “frequently use” it in controlling.

Table 63 summarizes the aggregated score, mean, standard deviation and ranking of responses from the nonacademic operative group related to the extent of use of qualitative and quantitative techniques in controlling activities. This table reinforces the findings of table 62, that Checklists and Management by Objectives are the most frequently used qualitative techniques, and Benchmarking and Cost-Benefit Analysis are the quantitative techniques more frequently used by this group in controlling tasks.

Table 64 shows the number of responses from the academic executive group related to the extent of use of qualitative and quantitative techniques in controlling activities. This table shows that 6 of 26 respondents indicated that they “always use” Checklists in controlling activities, and 12 of 26 “frequently use” it in controlling tasks. Similarly, 6 of 27 respondents indicated they “always use” Management by Objectives in controlling activities and 8 of 27 “frequently use” it in controlling tasks.

On the other hand, 4 of 28 respondents indicated that they “always use” Benchmarking in controlling functions, and 12 of 28

Table 63
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Nonacademic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities

QUALITATIVE	Extent of Use in Controlling				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	67	183	2.73	0.89	2
Checklists	68	200	2.94	0.75	1
Job Enrichment/Enhancement	62	139	2.24	0.98	5
Management by Objectives (MBO)	67	172	2.56	0.98	3
Management Information System (MIS)	66	157	2.37	1.01	4
Nominal Group Technique	67	93	1.38	0.54	7
Theory X & Y	66	97	1.46	0.78	6
QUANTITATIVE					
Benchmarking	70	204	2.91	0.84	1
Cost-Benefit Analysis	70	197	2.81	0.93	2
Forecasting: Regression Analysis	70	150	2.14	1.06	4
Linear Programming	68	116	1.70	0.96	7
Simulation Models	68	124	1.82	0.79	6
Statistic: Significance Testing	68	125	1.83	0.78	5
TQM: Cause-Effect Analysis (Fishbone Diagram)	69	153	2.21	0.95	3

Table 64
Number of Responses from the Academic Executive Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities

TECHNIQUES	Extent of Use in Controlling *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	26	4	10	8	4
Checklists	26	1	7	12	6
Job Enrichment/Enhancement	26	8	7	8	3
Management by Objectives (MBO)	27	4	9	8	6
Management Information System (MIS)	26	11	6	5	4
Nominal Group Technique	26	21	3	2	0
Theory X & Y	24	15	8	1	0
QUANTITATIVE					
Benchmarking	28	3	9	12	4
Cost-Benefit Analysis	28	4	8	12	4
Forecasting: Regression Analysis	27	16	8	2	1
Linear Programming	25	17	6	1	1
Simulation Models	27	17	7	3	0
Statistic: Significance Testing	28	15	9	3	1
TQM: Cause-Effect Analysis (Fishbone Diagram)	25	15	4	6	0

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

“frequently use” it in controlling. Four (4) of 28 respondents indicated they “always use” Cost-Benefit analysis in controlling tasks, and 12 of 28 “frequently use” it in controlling functions.

Table 65 summarizes the aggregated score, mean, standard deviation and ranking of responses from the academic executive group related to the extent of use of qualitative and quantitative techniques in controlling activities. This table strengthens the summary found in table 64, that Checklists and Management by Objectives are the more frequently used qualitative techniques, and Benchmarking and Cost-Benefit Analysis are the quantitative techniques more frequently used by this group in controlling tasks. It also is important to note that Statistic (Significance Testing) technique presents a better rank order for this group than for the other studied groups. This may suggest that this type of administrator has a greater preference for the use of this technique in controlling activities.

Table 66 presents the number of responses from the academic operative group related to the extent of use of qualitative and quantitative techniques in controlling activities. In this group, 6 of 28 respondents indicated that they “always use” Checklists in controlling tasks, and 13 of 28 reported that they “frequently use” it in controlling. Two (2) of 28 respondents indicated that they “always use” Brainstorming in controlling activities, and 10 of 28 indicated that they “frequently use” it in controlling tasks.

Table 65
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Academic Executive Group Related to the Extent of use of Qualitative and Quantitative Techniques in Controlling Activities

TECHNIQUES	Extent of Use in Controlling				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	26	64	2.46	0.94	3
Checklists	26	75	2.88	0.81	1
Job Enrichment/Enhancement	26	58	2.23	1.03	4
Management by Objectives (MBO)	27	70	2.59	1.00	2
Management Information System (MIS)	26	54	2.07	1.12	5
Nominal Group Technique	26	33	1.26	0.60	7
Theory X & Y	24	34	1.41	0.58	6
QUANTITATIVE					
Benchmarking	28	73	2.60	0.87	1
Cost-Benefit Analysis	28	72	2.57	0.92	2
Forecasting: Regression Analysis	27	42	1.55	0.80	5
Linear Programming	25	36	1.44	0.76	7
Simulation Models	27	40	1.48	0.70	6
Statistic: Significance Testing	28	46	1.64	0.82	3
TQM: Cause-Effect Analysis (Fishbone Diagram)	25	41	1.64	0.86	4

Table 66
Number of Responses from the Academic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities

TECHNIQUES	Extent of Use in Controlling *				
	Number	1 Number	2 Number	3 Number	4 Number
QUALITATIVE					
Brainstorming	28	6	10	10	2
Checklists	28	4	5	13	6
Job Enrichment/Enhancement	27	11	5	8	3
Management by Objectives (MBO)	27	11	1	12	3
Management Information System (MIS)	27	15	2	6	4
Nominal Group Technique	27	18	5	4	0
Theory X & Y	27	15	8	4	0
QUANTITATIVE					
Benchmarking	28	3	6	13	6
Cost-Benefit Analysis	28	5	4	11	8
Forecasting: Regression Analysis	28	14	6	8	0
Linear Programming	28	17	10	1	0
Simulation Models	28	18	5	5	0
Statistic: Significance Testing	28	12	8	8	0
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	11	3	14	0

* 1=Never Use 2=Occasionally Use 3=Frequently Use 4=Always Use

On the other hand, 6 of 28 respondents indicated that they “always use” Benchmarking in controlling tasks, and 13 of 28 “frequently use” it in controlling. Eight (8) of 28 respondents reported that they “always use” Cost-Benefit Analysis in controlling, and 11 of 28 “frequently use” it in controlling,

Table 67 summarizes the aggregated score, mean, standard deviation and ranking of the responses from the academic operative group related to the extent of use of the techniques in controlling activities. A relevant change in the rank order of TQM (Cause-Effect Analysis) can be noted in this table. This group ranked TQM in third place suggesting that there is a higher preference for the use of this technique in controlling activities than for the other groups.

Table 68 details the differences in the extent of use in controlling using management techniques by category and level of administrators. As can be seen in this table, all probabilities of category, and levels, exceed their appropriate critical value of $p < .05$ which leads to the judgment that there are no significant statistical differences between the group means on the responses. Averaged across factors (qualitative and quantitative techniques), the observed values of mean responses of the executive level administrators do not vary significantly from the observed values of mean responses of the operative level in each category (nonacademic and academic). It suggests that administrators have a similar extent of use in controlling, with the management techniques.

Table 67
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses from the Academic Operative Group Related to the Extent of Use of Qualitative and Quantitative Techniques in Controlling Activities

QUALITATIVE	Extent of Use in Controlling				
	Number	Aggregated Score	Mean	SD	Rank
QUALITATIVE					
Brainstorming	28	64	2.28	0.89	2
Checklists	28	77	2.75	0.96	1
Job Enrichment/Enhancement	27	57	2.11	1.08	4
Management by Objectives (MBO)	27	61	2.25	1.12	3
Management Information System (MIS)	27	53	1.96	1.19	5
Nominal Group Technique	27	40	1.48	0.75	7
Theory X & Y	27	43	1.59	0.74	6
QUANTITATIVE					
Benchmarking	28	78	2.78	0.91	1
Cost-Benefit Analysis	28	78	2.78	1.06	2
Forecasting: Regression Analysis	28	50	1.78	0.87	5
Linear Programming	28	40	1.42	0.57	7
Simulation Models	28	43	1.53	0.79	6
Statistic: Significance Testing	28	52	1.85	0.84	4
TQM: Cause-Effect Analysis (Fishbone Diagram)	28	59	2.10	0.95	3

Table 68
Differences on the Extent of Use in Controlling using Management Techniques by
Category and by Level of Administrators
N=160

Source*	DF	Seq SS	Adj SS	Adj MS	F	p
Category	1	0.886	0.667	0.667	1.94	.16
Levels	1	0.208	0.208	0.208	0.61	.43
Error	157	53.925	53.925	0.343		
Total	159	55.020				

Seq=Sequential sum of squares (each term is fit after all other terms in the model)

Adj=Adjusted sum of squares.

Management techniques refer to qualitative and quantitative techniques

* Category refers to type of administrators (nonacademic and academic)

* Levels refer to the two levels of administrators (executive and operative)

The Rational Decision-Making Process

Question number three of Part II of the questionnaire contained 9 inquiries focused on cognate information related to a departmental restructuring and budgetary problems. Respondents were asked to check diverse actions, best describing their level of agreement about an organizational or departmental problem, through a ranking scale of four options for nine different possible actions. Questions (a through f) were used to explore administrators' conceptual skills with the use of a rational process of decision-making. Similarly, questions (g, h, i) were used to examine respondents' interpersonal managerial skills. All items were adapted from Hellriegel and Slocum (1992).

Table 69 presents the number of the total responses related to the performance of viewing the organization and departmental unit as a whole and applying one rational process of thinking to solve problems related to the organization or departmental unit. According to Hellriegel and Slocum, managers are rational if they perceive a situation of change in the organization's environment and respond to it promptly by making the right decision using the correct process. As can be seen in Table 69 and Table 70, respondents ranked the diverse actions in a logical and rational order that permitted them to think in terms of relative priorities, rather than ironclad objectives and criteria. This behavioral mode of thinking suggests that the respondents are skilled at conceptualizing how organizational or departmental changes may affect their departments.

Table 69
Number of Responses Related to Diverse Decision-Making Actions to Take in Important Organizational or Departmental Problems

ACTIONS IN DECISION-MAKING	Level of Agreement *				
	Number	1	2	3	4
Analyze the situation carefully	159	0	1	20	138
Generate diverse alternatives	160	0	5	49	106
Evaluate alternative courses of action	159	1	2	41	115
Rank alternatives using objective criteria	159	1	18	66	74
Structure decisions based on intuitions	159	13	61	67	18
Integrate the decision with other decisions	158	0	8	65	85

* 1=Strongly Disagree 2=Disagree 3=Agree 4=Strongly Agree

Table 70
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses Related to Decision-Making Actions to Take in Important Organizational and Departmental Problems

ACTIONS IN DECISION-MAKING	Level of Agreement				
	Number	Aggregated Score	Mean	SD	Rank
Analyze the situation carefully	159	614	3.86	0.36	1
Generate diverse alternatives	160	581	3.63	0.54	3
Evaluate alternative courses of action	159	588	3.69	0.52	2
Rank alternatives using objective criteria	159	531	3.33	0.70	5
Structure decisions based on intuitions	159	408	2.56	0.79	6
Integrate the decision with other decisions	158	551	3.48	0.59	4

Table 69 shows that a great majority of respondents marked the option “agree” or “strongly agree” in the actions presented for a hierarchic mode of thinking in the decision-making process. However, it is important to note that responses related to the action marked as “e” in the questionnaire (structure decisions based on intuitions) present the highest disagreements score. This also suggests that administrators prefer applying specific procedures and techniques and do not rely solely on intuition for problem-solving.

The other items in question three, specifically marked “g” through “i” helped to evaluate respondents’ interpersonal managerial skills. Interpersonal skills refers to the managers’ abilities to lead, manage conflict, and work with other people.

Table 71 and 72 indicate the number, aggregated score, means, standard deviation, and ranking of responses related to this type of performance. As can be noted, almost 98 percent of the respondents “agree” or “strongly agree” with involving other people in their decisions, and with working with other people. This suggests that administrators have excellent interpersonal skills, and encourage participation in the decision-making process.

Table 71
Number of Responses Related to Decision-Making Actions to Take in Important
 Organizational or Departmental Problems Involving Interpersonal Skills

ACTIONS IN DECISION-MAKING	Level of Agreement *				
	Number	1	2	3	4
Evoke different viewpoints from others	157	1	4	45	107
Involve subordinates in decision-making	160	2	4	43	111
Inform subordinates and colleagues	159	0	5	36	118

* 1=Strongly Disagree 2=Disagree 3=Agree 4=Strongly Agree

Table 72
Aggregated Score, Mean, Standard Deviation, and Ranking of Responses Related to Decision-Making Actions to Take in Important Organizational or Departmental Problems Involving Interpersonal Skills

ACTIONS IN DECISION-MAKING	Level of Agreement				
	Number	Aggregated Score	Mean	SD	Rank
Evoke different viewpoints from others	157	572	3.64	0.56	3
Involve subordinates in decision-making	160	587	3.64	0.59	2
Inform subordinates and colleagues	159	590	3.71	0.52	1

Benefits in Applying the Techniques

Question four of the questionnaire was concerned with several benefits that are reported in the literature and are derived from using both qualitative and quantitative techniques. Some statements were adapted from Al-Kazemi (1993), and other items were aggregated in this question, for the purposes of this study.

In order to make the item as simple as possible, and to improve the reliability of the study, a decision was made not to use a scale format in this question in evaluating several statements or propositions related to presumed managerial benefits of using the techniques. Rather, respondents were instructed to check or to mark positively (yes) or negatively (no) if each one of the given benefits had been experienced in their department or organizational unit.

Table 73 details the number, percentage, and rank order of the total responses related to eight derived benefits in applying qualitative techniques in the departmental unit. Respondents were given a list of eight potential benefits, and were asked to indicate what benefits their department derives from using qualitative and quantitative techniques. As can be noted, the statement “help to clarify differences of opinion” (84.3 percent) was the most often reported benefit gained from using qualitative techniques. Interestingly, another three selected statements about benefits exceed 80 percent of the opinions. They were “more efficient services delivery,” “better quality decision making,” and “permit exploration of more policy alternatives.”

Table 73
Number, Percentage, and Rank Order of Total Responses Related to Eight Derived Benefits in Applying Qualitative Techniques in the Departmental Unit
 N=160

BENEFITS APPLYING QUALITATIVE TECHNIQUES	Number	Percentage	Ranking
Help to clarify differences of opinion	135	84.3	1
More efficient services delivery	134	83.7	2
Better quality decision-making	133	83.1	3
Permit exploration of more policy alternatives	132	82.5	4
Minimize risks	111	69.3	5
Potential cost savings	94	58.7	6
More timely information	92	57.5	7
Faster decision-making	73	45.6	8

Table 74
Number, Percentage, and Rank Order of Responses Related to Eight
Derived Benefits in Applying Quantitative Techniques in the Departmental Unit
 N=160

BENEFITS APPLYING QUANTITATIVE TECHNIQUES	Number	Percentage	Ranking
More efficient services delivery	138	86.2	1
Better quality decision making	130	81.2	2
Minimize risks	129	80.6	3
Potential cost savings	128	80.0	4
More timely information	104	65.0	5
Permit exploration of more policy alternatives	97	60.6	6
Help to clarify differences of opinion	95	59.3	7
Faster decision-making	90	56.2	8

Concerning the quantitative techniques, the first marked benefit was “more efficient services delivery” (86.2 percent). As shown in Table 74, “better quality decision-making” and “minimize risks” were claimed as benefits by 81.2 percent and 80.6 percent of the respondent users. To a considerable extent, the three top-ranked benefits are in agreement with the findings reported in chapter 2, that quantitative techniques are important in administrators decision-making processes. what was commented previously in chapter 2 concerning the role and importance of quantitative models in the decision making process.

Obstacles to the Use of the Techniques

Question five of the questionnaire included several statements or propositions related to presumed managerial obstacles to using the techniques. Diverse statements were adapted from Al-Kazemi (1993) and elsewhere, and were aggregated for this study.

In order to make this item as simple as possible and to improve the reliability of the study, a decision was made not to use a scale format in this question. Rather, respondents were instructed to check or to mark positively (yes) or negatively (no) if each one of the given obstacles was experienced at their department or organizational unit. Respondents were asked, “Please mark positively (yes) or negatively (no) the indicated obstacles you encounter in using qualitative and quantitative techniques at your department or organizational unit”. Table 75 reports the number, percentage, and rank order of the total responses related to the nine constraints that were selected by the respondents concerning

Table 75
Number, Percentage, and Rank Order of Responses Related to Nine
Presumed Constraints in Applying Qualitative Techniques
 N=160

OBSTACLES WITH QUALITATIVE TECHNIQUES	Number	Percentage	Ranking
Inadequate Training	77	48.1	1
Lack of time to analyze real problems	75	46.8	2
Inability to include all relevant variables	62	38.7	3
Resistance to and resentment of techniques	57	35.6	4
Lack of sufficiently competent personnel	47	29.3	5
Precluded by complexity of decision situation	44	27.5	6
Difficult to understand and apply	39	24.3	7
Decreased discretion and freedom on decisions	38	23.7	8
Inability to adapt to changing conditions	37	23.1	9

qualitative techniques. As can be noted, the statement “Inadequate training” is by far the overriding impediment, identified by 48.1 percent of the respondents. The second and third ranked barriers to the use of qualitative analysis were, respectively, “lack of time to analyze real problems” (46.8 percent) and “inability to include all relevant variables” (38.7 percent). The fourth most reported obstacle was “resistance to and resentment of the techniques” (35.6 percent).

Table 76 reports the number, percentage, and rank order of the total responses related to the nine constraints that were selected by the respondents related to quantitative techniques. As can be noted, the statement “Inadequate training” is by far the overriding impediment, identified by 66.8 percent of the respondents. The second and third ranked barriers to the use of quantitative analysis were, respectively, the same as reported for qualitative analysis, “lack of time to analyze real problems” (63.1 percent) and “inability to include all relevant variables” (58.1 percent). The fourth most reported obstacle was “difficulty to understand and apply ” (53.7 percent).

In analyzing these results, it seems that inadequate training is the major factor that contributes to the presence of other behavioral and technical obstacles to the use of management techniques. As can be noted in tables 75 and 76, there is a higher number of responses about obstacles in applying quantitative techniques than responses about applying qualitative techniques. This may suggest that administrators consider quantitative techniques more difficult to apply than qualitative techniques.

Table 76
Number, Percentage, and Rank Order of Responses Related to Nine Presumed
Constraints in Applying Quantitative Techniques
 N=160

OBSTACLES WITH QUANTITATIVE TECHNIQUES	Number	Percentage	Ranking
Inadequate Training	107	66.8	1
Lack of time to analyze real problems	101	63.1	2
Inability to include all relevant variables	93	58.1	3
Difficult to understand and apply	86	53.7	4
Lack of sufficiently competent personnel	84	52.5	5
Resistance to and resentment of techniques	81	50.6	6
Precluded by complexity of decision situation	80	50.0	7
Decreased discretion and freedom on decisions	63	39.3	8
Inability to adapt to changing conditions	59	36.8	9

These results are not unique to higher educational institutions, or to the educational sector. Other studies focusing on organizations in the industrial sector found similar results (Kathawala, 1988; Naude et al., 1991). For instance, “lack of time” was the major obstacle in Naude’s study. Al-Kazemi (1993), analyzing obstacles on quantitative techniques in the public sector (Government), also found “lack of time to analyze real problems” as the most important constraint.

Chapter Summary

The data presented in this research provides information for understanding the status and extent of use of managerial techniques by a sample of 160 administrators of colleges and universities in the state of Virginia.

The findings in this chapter reveal that administrators of four-year higher education institutions in Virginia maintain an excellent level of professional education and have extensive years of experience in their management positions.

As a whole, 97 percent of the respondents held a professional degree in the classical educational structure of doctorate, masters, and baccalaureate studies. Moreover, respondents have a variety of backgrounds or majors related to behavioral, social, and technical sciences.

Taking a closer look at the experience in their present positions, it can be noted that approximately 54 percent of the administrators held their work position between one and five years. On average these administrators had held their positions more than five years.

The findings also reveal that only 36 percent of the respondents reported to have received training that prepared them to apply qualitative techniques in their managerial functions, and 39 percent reported to have received preparation in the application of quantitative techniques. A contrast is noted when the groups are compared. The nonacademic category and executive level have the highest rate of positive responses in training received, rather than the operative groups, who, theoretically, require more participation in human development and training for their supportive and operative functions.

Related to the extent of use of software packages and computer technology in their decision-making processes, the majority of respondents reported using those logistical instrumentations from occasionally to frequently in their departmental decisions.

There was a moderate degree of familiarity or expertise with the managerial techniques. The most familiar qualitative techniques are Brainstorming, and Checklists. The most familiar quantitative techniques are Cost-Benefit Analysis, and Benchmarking.

In the planning, directing, reporting, and controlling functions, respondents reported a low extent of use. Both qualitative and quantitative techniques were directly related to their degree of familiarity with those techniques. However, it can be identified that scores and mean ranks of the use of qualitative techniques are higher than for quantitative techniques. This suggests that respondents both prefer and use qualitative techniques more than quantitative techniques

Additionally, the findings in this study yield an insight into the elements that inhibit the use of the techniques. The most reported impediments to use are: (a) inadequate training, (b) lack of time to analyze real problems, and (c) inability to include all relevant variables in their decisions. By contrast, the majority of the respondents recognize the benefits of using the techniques related to: (a) better quality of decision-making, (b) more efficiency in services delivery, and (c) minimizing risks.

No significant statistical differences were found between the groups with the applications of management techniques (qualitative and quantitative), by category (nonacademic and academic administrators), and by levels (executive and operative functions).

CHAPTER V

CONCLUSIONS, LIMITATIONS, AND IMPLICATIONS

The primary purpose of this study was to examine the status and extent of use by administrators of colleges and universities in the state of Virginia of qualitative and quantitative techniques of management in planning, directing, reporting, and controlling for effectively enhancing their administrative decision-making processes. It also was a goal of this study to explore some cognate individual and organizational information that may be associated with the extent of the use of these managerial techniques.

This chapter provides conclusions based on the major findings of the study and outlines the theoretical and practical implications for research and practice. It also presents the limitations of the study and sets forth directions for future research.

Major Conclusions

In the past few years, a growing number of colleges and universities in the state of Virginia, faced with the mounting challenges of demanding enrollments, cost containment, budget limitations, restructuring, and public pressure for accountability, have tried to improve performance by joining industry in adopting classical and modern managerial approaches, such as management by objectives, brainstorming, cost-benefit analysis, benchmarking, and total quality management, among others.

Although higher education institutions have been increasingly adopting the philosophy of continuing improvement in implementing changes, the current study presents evidence that managers or administrators in all

functional categories and levels are struggling with implementation challenges and that they need more preparation, and to expend more effort in the application of qualitative and quantitative methodologies of management.

It was a premise of this study that modern administrators' challenges may be faced through successful applications of most of the qualitative and quantitative techniques mentioned. If limited resources are being put to use, managerial techniques have a crucial part to play in processing information and enhancing the routine and new decisions needed to operate an effective academic system.

This study is believed to be the first to examine the use of qualitative and quantitative managerial techniques at institutions of higher education in the state of Virginia.

The findings show that respondents have high levels of education and accumulated experience in their nonacademic and academic administrative positions, present a moderate knowledge or familiarity with the diverse managerial techniques, and use these techniques occasionally and repeatedly. Three techniques from both qualitative and quantitative approaches were selected in various rank orders by the respondents as being the most meaningful in terms of familiarity and extent of use in the administrative tasks. These techniques, ranked according to the aggregated score and mean usage, were: (a) Qualitative Techniques: Brainstorming, Checklists, and Management by Objectives, and (b) Quantitative Techniques: Cost-Benefit Analysis, Benchmarking, and Forecasting (Regression Analysis).

The degree of familiarity and extent of use of the other four techniques, in both qualitative and quantitative approaches were found to be low. These techniques were: (a) Qualitative Techniques: Job Enrichment/Enhancement, Management Information System, Nominal Group Technique, Theory X & Y., and (b) Quantitative Techniques: Linear Programming, Simulation Models, Statistical Significance Testing, and Total Quality Management (Cause-Effect Analysis).

The survey provides evidence that Brainstorming and Checklists are among the most frequently used qualitative techniques, followed by Cost-Benefit Analysis and Benchmarking in the quantitative area. These results imply that respondents hold a greater preference for qualitative than quantitative techniques in managerial applications.

The percentage of responses using a given technique is often presented as evidence of its widespread applicability. In reviewing the literature, the results of this study do not appear to be entirely in line with other studies of this type.

The literature concerning higher education has explained much about the principles, philosophy, and ideas behind several qualitative methodologies and has discussed how they apply to institutions of higher education (Bishop, 1982; Cope, 1981; Franklin, 1989; Meabon, Sims, Suddick, & Alley, 1976; Talbot, 1992), but in relation to the extent of applicability and implementation of such techniques, relatively little has been determined. The research by Meabon, Suddick, Owens, and Klein (1981) referred to Management by Objectives (MBO) as the most familiar technique used in the student personnel departments. Berman (1978) in a

survey of 34 community college student personnel departments found that near 50 percent applied this type of technique.

By contrast, the quantitative area surveys have resulted in surprising and informative findings. For example, diverse criteria and studies dealing with quantitative techniques applied to functional areas of different types of organizations (Al-Kazemi, 1993; Gaither, 1975; Green, Newson, & Jones, 1977; Horine & Hailey, 1995; Kiani-Aslani, 1977; Morgan, 1989; White, 1987) have reported the adoption of linear programming, simulation, forecasting, and total quality management as the most relevant techniques being used. Shannon, Long and Buckles (1980), in their survey comparing the utility rank orderings of academic respondents to those in government and industry, concluded that the biggest disagreements in results were over linear programming, decision trees, and queuing theory techniques. The university respondents were obviously more impressed by linear programming than were the nonacademic respondents. However, accepting many of these studies as representative, it appears that quantitative techniques, with some exceptions, are not widely used in functional areas at diverse institutions and diverse non-educational settings.

In defense of the findings of this study, Naude, Stray, and Wegner (1991) point out that the reasons for the low utilization of quantitative techniques can be expected to vary between managers who have the knowledge and decide not to implement the techniques, and those who lack the requisite knowledge. Keeping these conflicting views in mind, the literature also provides support for the limitations inherent in whenever new techniques or approaches are being introduced in organizations. A new

management approach, such as total quality management (TQM), can only be understood by managers and employees via interpretation through existing schemas, and these schemas (a person's construction of reality) can produce different types of applications, depending on the differences in organizations and people (Reger, Gustafson, Demarie, & Mullane, 1994).

According to Hackman and Wageman (1995), Brainstorming is a technique used by groups to generate lists of ideas about matters such as the potential causes of a problem, possible solutions, and issues likely to be encountered in implementing those solutions. In the present study, the extensive democratic style of management that was found and the culture and organizational characteristics of the colleges and universities in the sample may be related to administrators' collective knowledge and usage. In this study, for example, the Nominal Group Technique was found to be one of the least familiar and least used techniques reported by the respondents. However, the literature (Hawkins, 1990; Latta & Downey, 1994; Talbot, 1992) indicates that this technique is very integrative and useful for human participation in decision-making about evaluation of academic activities in postsecondary education.

On the other hand, a cause-and-effect diagram (fishbone) is a graphic representation used to analyze the relationship between a problem and its potential causes. This total quality management device is used to help groups examine qualitatively and as thoroughly as possible the potential causes of a problem and discern the relationships among those causes. In the present study, this technique was found to be little known and little used. Authorities on TQM suggest that this technique can help "quality"

teams use their collective knowledge effectively to identify and analyze opportunities to improve quality services in education. However, respondents reported more familiarity with TQM than actual extent of use in planning, reporting, directing, and controlling activities. Scores related to the extent of use in each functional activity were under an average mean of 2.70, indicating that the techniques were only occasionally used.

The general linear model was useful in testing the data classified by the categorical position of the respondents (nonacademic and academic), functional levels (executive and operative), and factors (the qualitative and quantitative techniques). The model was designed to analyze statistical differences among the diverse demographic responses regarding the techniques. The findings allow a conclusion that the profiles of use across job titles (degrees or levels of education), job positions, management level, and functional area are virtually identical. No statistically significant differences between respondent profiles of the four groups could be established.

Part II of the questionnaire, question three, contained nine inquiries focused on cognate information related to a departmental restructuring and budgetary problem. These inquiries were used to analyze administrators' abilities and managerial skills in the use of a rational decision-making method. It was assumed that the high level of professionalism of the respondents permitted classification and ordering of certain selected actions in response to an administrative problem that included a sense of direction, organizational and analytical ability, good judgment, and integrity (Deal & Kennedy, 1982; Hellriegel & Slocum, 1992; Foxley, 1980; Naisbitt, 1982;

Owens, 1991). Then, as part of the respondents' analytical abilities to make decisions using the techniques in their organizational or departmental units, various problem propositions were included as one question to delimit ability and capacity to decide.

The high frequency of respondents listing the option "agree" and "strongly agree" in response to the actions expressed in the items, indicated use of a rational mode of thinking in the decision-making process. Respondents ranked the diverse actions in a logical and rational process that permitted them to think in terms of relative priorities, rather than of ironclad objectives and criteria. This behavioral mode of thinking suggests that respondents have good conceptual and interpersonal skills in being able to perceive how organizational or departmental changes may affect their areas. It also suggests that respondents like to apply specific procedures and techniques, and they do not make their decisions based on intuitions.

According to Hellriegel and Slocum (1992) managers are "rational" if they perceive a situation that requires a change in the organization's environment, and respond to it promptly by making the right decision, using the correct process.

Closely linked to conceptual managerial skills were the responses given on items marked "g" through "i" in the same question, which was designed to evaluate respondents' interpersonal managerial skills. According to Hellriegel and Slocum, interpersonal skills concern the managers abilities to lead, manage conflict, and work with other persons. Almost 98 percent of the respondents reported that they "agree" and "strongly agree" with involving people in their decisions and working with them. Thus, it may be

suggested that the respondents have good interpersonal skills and like to work with others.

Another major finding of this study was that the respondents hold a positive perception about the values of using qualitative and quantitative managerial techniques in higher education. Respondents were given a list of eight potential benefits, adapted and modified from Al-Kazemi (1993). They were asked to indicate what benefits their department derived from using qualitative and quantitative techniques. Interestingly, a high percentage reported that the most significant benefit of using such techniques was to “help to clarify differences of opinion.” This finding occurred for both qualitative and quantitative factors. Other statements about benefits that received positive responses were: (a) more efficient services delivery, (b) better quality decision-making, (c) permit exploration of more policy alternatives, and, (d) minimize risks. To a considerable extent, the indicated benefits agree with past surveys (Al-Kazemi, 1993; Green, Newson, & Jones, 1977; Morgan, 1989).

Related to obstacles to using these techniques, respondents were instructed to mark positively (yes) or negatively (not) to a series of nine statements that discussed constraints derived from findings in the literature about constraints (Al-Kazemi, 1993; Kiani-Aslani, 1977; Morgan, 1989). The findings concerning the qualitative techniques seem to indicate that the most common barrier was “inadequate training.” Other obstacles noted were: “lack of time to analyze real problems,” and “inability to include all relevant variables.”

The highest percentages of responses related to obstacles to using quantitative techniques were that qualitative techniques are less difficult to understand and apply than quantitative techniques. Thus, the use and implementation of such quantitative techniques involve more obstacles than do qualitative techniques. These findings are not unique to institutions of higher education. Other studies focusing on other types of organizations found similar, or nearly similar results (Kathawala, 1988; Naude et al., 1991). For instance, “lack of time” was the major obstacle found in Naude’s study. Al-Kazemi also reported inadequate training as the most frequent obstacle in applying quantitative techniques in organizations in the public sector.

Another major finding was that respondents hold an excellent level of professional education that may support future initiatives to enhance capability and development. Additionally, they averaged sufficient years of experience (more than five years) in their positions to permit future efforts to apply and implement such techniques in their organizations and departmental units.

An organizational factor that was considered important and closely related to the application of quantitative techniques was the role that computers play in analyzing data or solving problems at the departmental level. During the last few years there has been a significant increase in the number of software packages that implement and extend the use of quantitative techniques. The rapid proliferation of this type of software has given rise to a need for standard, objective, evaluation of these packages, to enable educators and administrators to select appropriate software for their

needs (Zanakis, Kara, Sahay, & Sivasubramaniam, 1991). The questionnaire used in this study inquired about the application of relevant software packages for analyzing data or solving the departmental problems of the respondents. The findings indicated that 51 percent of the respondents use special software packages related to quantitative techniques, and, the findings related to computer usage at the departmental level reported similar use for all groups.

However, when the above results are linked with the low mean values reported in the use or application of management information systems (integrated as a qualitative technique) for diverse administrative functions, a conflicting point of view of the scope of their use may be perceived in the responses. A management information system (MIS) generally refers to collection, storage, and retrieval of information for both planning and control functions. This concept was used as the basis for the question related to the extent of use, and was communicated to respondents in a glossary of terms identifying operational definitions and techniques. According to Schroeder (1978), the scope of an MIS may be quite broad, or limited, depending on the particular application. However, even limited MIS are usually computerized to handle the large amount of data involved. Even so, respondents in this study reported occasional to frequent use of MIS as a technique.

Limitations of the Study

Given the limitations of formal decision-making, tools such as the managerial techniques selected should be used with great care. Hence sufficient steps were taken to ensure the reliability of the respondents' judgments. A pre-test and pilot study were conducted in order to improve the questionnaire. In each comparison matrix, the largest inconsistency cells linked with any technique were identified, and some of them with high collinearity were eliminated at the researcher's discretion and under the Advisory Committees' supervision. To this end, both aggregated scores and a General Linear Model were used to make statistical conclusions about the individual ratings, as well as between techniques' usages.

The academic operative sample size was under-represented and this sample error in the research design affected generality. There were limitations and difficulties in identifying and contacting academic administrators at the operative level, especially to the department chairs in the institutions selected. The author recognizes that the sample size and method of selection of respondents places limitations upon the conclusions that can be drawn from the data. On the other hand, there were some unknown factors which caused some administrators to respond and others not to respond to the questionnaire. Consequently, it was difficult to assess the sampling errors or to make strong inferences about the total population. However, the results of the survey are probably not too surprising and the ranked techniques and variables tend to agree with most of the prior studies on the topic.

The survey provided information on the types of techniques, and on some of the problems perceived by the respondents in their applications. It was explained that there is no clear evidence about differences in application by category and level of respondents. Also, the reviews do not reveal information by type of control, institutional size, or respondents' professional affiliations.

Finally, it should be recalled that just because a particular methodology is not widely known or perceived to have great utility, that does not mean that it is not a powerful and useful managerial tool for solving specific problems. The survey shows that a number of qualitative techniques enjoy a higher moderate use than quantitative models in the context of the administration of some of the institutions of higher education in Virginia.

Future Research Implications

Studies of qualitative and quantitative methodological initiatives cannot be isolated from day-to-day institutional operations. Successful application and implementation of the techniques will not result from isolated training sessions for selected administrators or employee groups, and a few cross-functional improvement teams, or from the establishment of a quality control council or office. Managerial techniques must be selected as a result of clearly defined goals and strategic plans, and must be planned and managed with the same passion and thoroughness as any other organizational strategy. The commitment of senior leadership, a flexible, responsive organizational culture, empowerment of the personnel, and

training and development at all levels are required to sustain managerial practices and to overcome the obstacles to changes. The challenge for everyone is how to continue the momentum given the pressing day-to-day demands and rapid organizational changes. To achieve the anticipated results from examining the use of managerial techniques, management theory and practice must become a routine way of doing business in educational institutions.

A more detailed investigation is needed about types of challenges faced by college and university administrators, and the information which is required for their decisions. At the present time, there is not sufficient data available in this regard in the area of higher education at the state level. Future research should continue to investigate other questions not addressed in this study, such as:

- a) How are the changes in management skills occurring, given the ongoing restructuring process in educational institutions?
- b) How are organizational changes perceived by others in institutions of higher education?
- c) What can college and university administrators and employees do to maximize their own development?
- d) What is the impact of new managerial techniques, such as TQM on administrators' skills in educational organizations?

It is recommended that the findings of this study be tested in a larger sample, one that includes other institutions of higher education. Moreover, it would be interesting to design a more detailed investigation only in management skills of academic administrators at the operative level,

especially the department chairs, in the institutions of higher education at the national and state levels.

The results of this study have implications for the ways in which administrators can develop their own skills in the use of qualitative and quantitative techniques. And further there are implications about the ways in which institutional top management can support others' development, including faculty, and about how institutions of higher education in the state of Virginia can facilitate training and development.

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Appendix A
The Survey Instrument

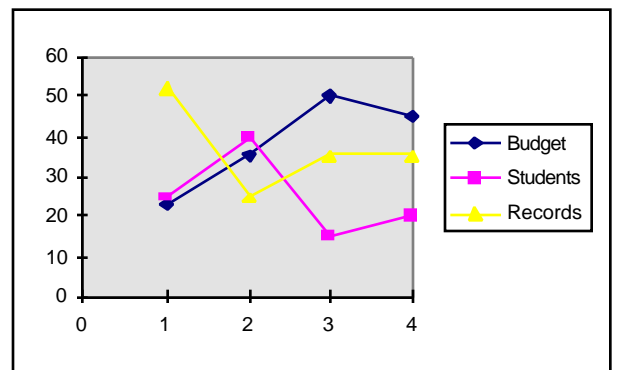
APPROACHES TO DECISION MAKING

INSTITUTIONAL SURVEY

QUALITATIVE



QUANTITATIVE



MANAGERIAL TECHNIQUES



COLLEGE OF HUMAN RESOURCES AND EDUCATION
Department of Educational Leadership and Policy Studies
Educational Administration Program

PURPOSE

This survey is a research effort to examine the extent to which college and university administrators use qualitative and quantitative managerial techniques for decision making in their administrative/academic activities. It is hoped that results of this study will provide valuable information about certain managerial technology so that higher education administrators and educators may use for enhancing their personal and institutional decision making processes.

Please complete and return the questionnaire in the next few days. For your convenience a postage paid enveloped is enclosed. Please answer all of the questions. If you wish to comment on any question or qualify your answer, you may use the margins or a separate sheet of paper. Thank you for your time and cooperation.

PART I

1. Please indicate your degree of familiarity or expertise with each of the following qualitative and quantitative techniques by checking the response options 1, 2, 3, or 4 (see enclosed Glossary of Terms for the definition of each technique).

- 1 = Not Familiar
- 2 = Vaguely Familiar (no expertise)
- 3 = Somewhat Familiar (limited expertise)
- 4 = Very Familiar (expert)

DECISION MAKING TECHNIQUES	EXPERTISE			
QUALITATIVE	1	2	3	4
Brainstorming				
Checklists				
Job Enrichment/Enhancement				
Management by Objectives (MBO)				
Management Information System (MIS)				
Nominal Group Technique				
Theory X & Y				
QUANTITATIVE	1	2	3	4
Benchmarking				
Cost-Benefit Analysis				
Forecasting: Regression Analysis				
Linear Programming				
Simulation Models				
Statistic: Significance Testing				
TQM: Cause-Effect Analysis (Fishbone Diagram)				

PART II

3. Please use major decisions made by your organization or departmental unit in recent years as the frame of reference for answering the questions below. Check the number best describing the level to which you agree with the following statements.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Agree
- 4 = Strongly Agree

In making important decisions, such as organizational or departmental restructuring or budgetary cuts, you would:

ACTION OR ACTIVITY	LEVEL			
	1	2	3	4
a. Analyze the situation carefully				
b. Generate diverse alternatives				
c. Evaluate alternative courses of action				
d. Rank alternatives using objective criteria				
e. Structure decisions based on intuitions				
f. Integrate the decision with other decisions				
g. Evoke different viewpoints from others				
h. Involve subordinates in decision making				
i. Inform subordinates and colleagues				

4. From the following list, please mark positively (yes) or negatively (no) the indicated benefits you derive in applying qualitative and quantitative techniques in your department or organizational unit. Please respond to each of the presumed benefits below.

BENEFITS	Qualitative		Quantitative	
	Yes	No	Yes	No
a. More efficient services delivery				
b. Help to clarify differences of opinion				
c. Minimize risks				
d. Better quality decision making				
e. Permit exploration of more policy alternatives				
f. Potential cost savings				
g. Faster decision making				
h. More timely information				

5. From the following list, please mark positively (yes) or negatively (no) the indicated obstacles you encounter in using qualitative and quantitative techniques in your department or organizational unit. Please respond to each of the presumed obstacles below.

OBSTACLES	Qualitative		Quantitative	
	Yes	No	Yes	No
a. Difficulty to understand and apply				
b. Inability to adapt to changing conditions				
c. Inability to include all relevant variables				
d. Precluded by complexity of decision situation				
e. Decreased discretion and freedom on decisions				
f. Resistance to and resentment of techniques				
g. Lack of sufficiently competent personnel				
h. Lack of time to analyze real problems				
i. Inadequate training				

6. What style of decision making do you believe is most often applied in your organization or departmental unit? (check one only)

- a. The Autocratic Style ()
 b. The Democratic Style ()
 c. The Laissez-Faire Style ()

7. To what extent are computers used in the decision making process of your department? (Check one)

- 1 = Not used ()
 2 = Occasionally Used ()
 3 = Frequently Used ()
 4 = Extensively Used ()

8. Does your department or unit use particular software packages or specific computer programs for analyzing data or solving problems?

Qualitative: Yes () No ()

Quantitative: Yes () No ()

9. Have you or your staff received training from your organization or other institutions to learn to apply qualitative or quantitative techniques in decision making?

Qualitative: Yes () No ()

Quantitative: Yes () No ()

PART III

10. Your Position/ Title: _____

11. Is your position primarily academic () or nonacademic ()

12. How long have you been in your Institution :

0 - 5 Years	()
6 - 10 Years	()
11 - 15 Years	()
16 - 20 Years	()
21 Years or more	()

13. Number of Years in your current position: ()

14. What is the highest degree you have obtained?

Bachelor () Master () Doctorate () Other ()

15. FIELD OF STUDY: (Field of study for highest degree completed).

<p>_____ Accounting</p> <p>_____ Biological Sciences</p> <p>_____ Business / Economic</p> <p>_____ Education</p> <p>_____ Engineering</p> <p>_____ Humanities</p>	<p>_____ Law</p> <p>_____ Mathematical / Computer Sciences</p> <p>_____ Medicine</p> <p>_____ Physical Sciences</p> <p>_____ Social Sciences</p> <p>_____ Other</p>
---	---

Thanks

Please return this survey to:

Carlos A. Valero
1104 Ascot Lane
Blacksburg, VA 24060

Appendix B
Letter Forms Used for the Study
Pre-test, Pilot Study
Survey, Follow-up

Carlos A. Valero
1104 Ascot Lane
Blacksburg, VA 24060

June 14, 1996

Dear University Officer:

As part of my doctoral program in the College of Human Resources and Education at Virginia Polytechnic Institute and State University, I am conducting a study to examine the extent at which college and university administrators use some qualitative and quantitative techniques for decision-making in planning, directing, reporting, and controlling both in their administrative and academic levels of operations. I will also explore potential benefits and obstacles associated with variations in usage.

At this stage of the study, I am writing to ask for your help in pretesting the enclosed questionnaire. From the responses to this pretest, a final questionnaire will be sent to administrative, academic, and operative administrators of public and private colleges and universities throughout the state of Virginia.

In order to make the final version of the questionnaire as complete and meaningful as possible, your response to this pretest will be deeply appreciated and will contribute significantly to the success of the study. When completing the questionnaire, if you would take the time to indicate your comments regarding the questionnaire it would be very helpful in making any necessary revisions. Specifically, I would appreciate your comments concerning (a) the readability and clarity of the questionnaire, (b) amount of time necessary to complete the questionnaire, and (c) any difficulties encountered in completing the instrument.

Considering that differences in knowledge, expertise, and degree of authority related to the diverse managerial techniques used, they might possibly be a limiting factor in completing the data. A set of definitions or glossary of terms is attached to the questionnaire. It is to be used by the respondents.

You may be assured of complete confidentiality. I am only interested in statistical summaries. None of the information will be identified in regards to the name of the individual completing the questionnaire or the name of the institution. A stamped, self-addressed envelope is included for your convenience in returning the questionnaire.

I will be very happy to answer any questions you might have. Please do not hesitate to communicate with me. My e-mail address is: ovalero@vt.edu

Thank very much for your assistance and cooperation.

Sincerely,

Carlos A. Valero

Universidad del Zulia

Maracaibo-Venezuela
P.O.Box 526

Carlos A. Valero

1104 Ascot Lane
Blacksburg, VA 24060

Fax: (540) 951-0915
Email: ovalero@vt.edu

July 12, 1996

Dear _____ :

I am a faculty member from the Universidad del Zulia in Maracaibo, Venezuela. I am currently performing a research project as part of my doctoral program in the College of Human Resources and Education at Virginia Polytechnic Institute and State University.

The enclosed questionnaire is part of my dissertation project. The main goal of this study is to examine the status and extent at which administrators of colleges and universities in the state of Virginia apply qualitative and quantitative techniques of management in planning, directing, reporting, and controlling for enhancing their overall administrative/academic decision-making process. The study investigates some types of techniques used, frequency of use, managerial benefits and obstacles, and some individual and organizational factors involved in implementing such techniques.

The questionnaire has been reviewed by my Advisory Committee and pretested by some important administrators and researchers at Virginia Tech.

Radford University was selected randomly for the pilot study. For this reason, I am writing to ask your help in providing me with feedback for analyzing the reliability of the survey and to make any changes to improve the instrument in general. The questionnaire is organized for quick answering, so it will take no more than fifteen minutes to fill out. All responses will be strictly confidential. I am only interested in statistical summaries. Neither individuals nor institutions will be identified by name.

Considering the diversity of administrative/academic levels, and the degree of professionalism with administrators in institutions of higher education, it is possible that some differences in concepts and terminology related to the managerial techniques might be factors limiting the completion of the data. In this sense, a set of definitions or glossary of terms is being attached to the questionnaire to be used by the respondents.

Thanks for your cooperation and participation in this study.

Carlos A. Valero

COLLEGE OF HUMAN
RESOURCES AND EDUCATION
Department of Educational
Leadership and Policy Studies
Educational Administration
Program



September 28, 1996

Dear Dr. :

Decision making among college and university administrators is crucial to the success of higher education and is the topic of an important study on the subject in which you are invited to participate. You were chosen randomly from all four-year institutions in Virginia and all administrative positions within the institutions to provide important information about your approaches to decision making used in your administrative position.

From the many approaches to decision making used in higher education, certain qualitative and quantitative techniques were selected for study. Each of these techniques may be seen to be in wide-spread practice in the administration of higher education. Each also is believed to be related to institutional accountability and responsiveness to multiple constituencies. Our interest is to study the level of your knowledge about your use of each such techniques and any associated benefits or liabilities that may accrue therefrom to your college or university. Results from this study may inform administrative practitioners about contemporary decision making practices and lead to improvements in institutional management through appropriate education and training.

Twelve institutions from Virginia were selected randomly for this study; twenty-four administrators from each institution are being asked to participate by completing the enclosed questionnaire. With these small

numbers, it is vital that each selected informant respond to the questions asked on the questionnaire. Please give your attention to this matter within the next few days. One of our representative will be in touch with you soon if we have not received your response.

All information collected for this study will be aggregated by type of position and institution; neither individuals nor institutions will be identified by name. This study is conducted with the full approval of the Institutional Review Board of Virginia Tech. If you have questions about the study please contact either of us or individuals listed in the framed statement below.

Thanks you for your help,

Don G. Creamer
Professor
301 E. Eggleston Hall
Virginia Tech
Blacksburg, VA 24061-0302

Carlos A. Valero
Doctoral Student
1104 Ascot Lane
Blacksburg, VA 24060

This research project has been approved, as required, by the Institutional Review Board for projects involving human subjects at Virginia Polytechnic Institute and State University and by the Educational Leadership and Policy Studies Department of the College of Human Resources and Education. Questions or problems regarding your rights as a participant should be address to Dr. David Alexander, Chair, Department of Educational Leadership and Policy Studies, at (540) 231-5642 or Dr. Tom Hurd, Director of Sponsored Programs, at (540) 231-5281.

October 21, 1996

Dear Dr. :

Approximately three weeks ago, a survey package was sent to you seeking information about the extent of use of certain qualitative and quantitative managerial techniques in the decision making process at your departmental unit in your organization. If you completed the questionnaire and returned it to me, please accept our sincere thanks and appreciation for your cooperation.

If you have not had the time to respond, this is a second plea for your help. Your name was selected as part of a random sample from twelve four-year institutions of higher education in the Commonwealth of Virginia, and your response is vital to secure an adequate and useful study.

If by some chance you did not receive the questionnaire or it has been misplaced, please call me immediately or communicate with me by e-mail and I will forward another survey to you. Remember, your response is vital to a satisfactory completion of this study. I wish to repeat to you our promise of confidentiality. None of the responses will be identified by names. The information you provide will be well protected and only general findings and statistics will be reported. This study is conducted with the full approval of the Institutional Review Board of Virginia Tech.

Cordially,

Carlos A. Valero
Doctoral Student Virginia Tech
1104 Ascot Lane
Blacksburg, VA 24060

Appendix C

Correlation Matrices

Correlation Matrix - Question 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Brainstorming	1.000													
Checklists	-0.325	1.000												
Job Enrichment	0.013	0.147	1.000											
MBO	-0.110	-0.064	0.130	1.000										
MIS	0.000	0.000	0.520	-0.180	1.000									
NGT	-0.350	0.325	0.586	0.110	0.494	1.000								
Theory X & Y	-0.076	0.136	0.817	0.179	0.537	0.359	1.000							
Benchmarking	-0.082	0.200	0.941	0.262	0.405	0.616	0.772	1.000						
Cost-Benefit	-0.260	0.076	0.519	-0.127	0.000	0.438	0.250	0.416	1.000					
Forecasting	-0.154	0.185	0.470	0.176	0.277	0.700	0.311	0.431	0.655	1.000				
Linear Program	-0.165	0.229	0.651	0.180	0.375	0.576	0.537	0.540	0.676	0.899	1.000			
Simulation	-0.268	0.296	0.561	-0.060	0.156	0.473	0.638	0.460	0.460	0.331	0.467	1.000		
Statistic: Testing	-0.143	0.408	0.505	0.164	0.129	0.652	0.345	0.402	0.541	0.718	0.773	0.710	1.000	
TQM:Cause- Effect	0.034	0.070	0.565	-0.028	0.166	0.622	0.302	0.607	0.607	0.466	0.332	0.294	0.349	1.000

Correlation Matrix - Question 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Brainstorming	1.000													
Checklists	0.467	1.000												
Job Enrichment	0.536	0.680	1.000											
MBO	-0.239	0.274	0.176	1.000										
MIS	-0.281	0.176	0.013	0.526	1.000									
NGT	0.388	0.454	0.861	0.352	0.223	1.000								
Theory X & Y	0.284	0.535	0.591	0.391	-0.113	0.535	1.000							
Benchmarking	0.302	0.532	0.437	0.243	0.258	0.401	0.220	1.000						
Cost-Benefit	0.372	0.220	0.353	0.377	0.423	0.521	0.230	0.770	1.000					
Forecasting	0.319	0.343	0.516	0.443	0.283	0.779	0.393	0.665	0.741	1.000				
Linear Program	0.445	0.306	0.626	0.401	0.269	0.826	0.286	0.596	0.746	0.923	1.000			
Simulation	0.240	0.335	0.471	0.282	0.148	0.664	0.712	0.415	0.484	0.786	0.615	1.000		
Statistic: Testing	0.218	0.406	0.704	0.290	0.339	0.743	0.145	0.603	0.555	0.675	0.802	0.395	1.000	
TQM:Cause-Effect	0.283	0.198	0.472	0.216	0.017	0.610	0.646	0.530	0.642	0.752	0.612	0.884	0.379	1.000

Correlation Matrix - Question 3

	1	2	3	4	5	6	7	8	9
Analyze	1.000								
Generate	0.349	1.000							
Evaluate	0.570	0.434	1.000						
Rank	0.349	1.000	0.434	1.000					
Structure	0.501	0.817	0.721	0.817	1.000				
Integrate	0.503	0.345	0.854	0.345	0.553	1.000			
Evoke	0.243	0.319	0.277	0.319	0.316	0.555	1.000		
Involve	0.199	0.654	0.214	0.654	0.553	0.430	0.752	1.000	
Inform	-0.062	0.158	-0.283	0.158	-0.279	-0.318	-0.430	-0.116	1.000

Vita

Carlos Alberto Valero H.
1104 Ascot Lane Blacksburg, VA, 24060
(540) 951-0915 e-mail: ovalero@vt.edu

Education

Candidate for Doctor of Education in Educational Administration at Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 1997.

Master in Business Administration (MBA) at Oklahoma City University, Oklahoma City, Oklahoma, 1983.

Licentiate in Business Administration at La Universidad del Zulia, Maracaibo, Venezuela, 1970.

Professional Experience

Academic Director of the Interamerican Center of Advanced Studies in Management (November, 1988-October, 1991). Maracaibo, Venezuela.

Financial Counselor of Zulia Clinic Hospital (January, 1990-December, 1990). Maracaibo, Venezuela.

Financial Counselor Zulian Group Foundation for Maracaibo Stock Exchange (November, 1986-December, 1987). Maracaibo, Venezuela.

Coordinator and Director of Graduate Studies in Management at the Social and Economic Science College of the Universidad del Zulia (February, 1985-October, 1988). Maracaibo, Venezuela.

Financial Counselor Zulia State Lawyers Association College (January, 1980-December, 1980). Maracaibo, Venezuela.

President of Venezuelan Financial Executives Association, Zulia Branch (January, 1979-December 1980). Caracas, Venezuela.

Management Counselor of Eastern Venezuela Industrial Construction (January, 1979-December, 1979). Ciudad Ojeda, Venezuela.

Administrative Manager of the Professors' Saving and Loan Cooperative in the Universidad del Zulia (October, 1970-January, 1978). Maracaibo, Venezuela.

Teaching Experience

La Universidad del Zulia, Maracaibo, Venezuela (February 1972 - Present). Full professor in the following areas: (a) Financial Mathematics, (b) Basic Statistics, (c) Banking and Financing, (d) Financial Administration of the Firm, (e) Finance and Budgeting, (f) Financial Diagnostic of Enterprises.

Rafael Maria Baralt University, Cabimas, Venezuela (February, 1987-November, 1992). Part-time Professor in the following areas: (a) Financial Analysis and Inflation, (b) Management of Educational Institutions.

Interamerican Center of Advanced Studies on Management, Maracaibo, Venezuela (February 1989-November 1991). Part-time Professor in the following courses: (a) Industrial Costs and Control, (b) Organization Behavior and Performance, (c) Engineering Economic of Projects.

Tachira Experimental National University, San Cristobal, Venezuela (July, 1989-July 1992). Part-time Professor in the following areas: (a) Financial Policy and Strategy, (b) Financial Diagnostic of Enterprises.

Rafael Urdaneta University, Maracaibo, Venezuela (February, 1985-November, 1991). Part-time professor in the following areas: (a) Budgeting Planning and Control, (b) Financial Administration of Small Firms, (c) Theory and Practices of Management in Profit Organizations.

Research Papers and Publications

Valero, C. A. (1990). Case problems in strategy management. Maracaibo, Venezuela: CIESE.

Valero, C. A. (1989). Financial diagnostic: a strategic and systemic approach. Maracaibo, Venezuela: La Universidad del Zulia.

Valero, C. A. (1985). The MBA educational plan for the Economic and Social Sciences Graduate Division of the Universidad del Zulia. Maracaibo, Venezuela: College of Economic and Social Sciences. Universidad del Zulia.

Valero, C. A. (1980). Credit and collection under risk in underdeveloped countries. Maracaibo, Venezuela: La Universidad del Zulia.

Valero, C. A. (1977) Financial analysis in inflationary contexts. Maracaibo, Venezuela: La Universidad del Zulia

Research Interests

Organizational Behavior and Performance

Organization Development and Change

Financial Policy and Strategy in Profit and Non-Profit Organizations

Professional Memberships

Venezuelan Association of University Professors

American Association of Financial Management Executives