

# **EVALUATION OF QUALITATIVE AND QUANTITATIVE TECHNIQUES IN DECISION-MAKING: A CASE STUDY.**

By

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A project submitted in partial fulfillment of the requirements for the degree of  
Master of Science in Engineering (M.Sc.Eng.) in Department of Mechanical Engineering



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IN DECISION-MAKING: A CASE STUDY.**

A thesis report is submitted to the Department of Mechanical Engineering, Khulna University of Engineering & Technology (KUET), Bangladesh, in partial fulfillment of the requirements for the Degree of **Masters of Science in Engineering (M.Sc. Eng.) in Mechanical Engineering.**

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## DECLARATION

This is to certify that the thesis work entitled “Evaluation of qualitative and quantitative techniques in decision-making: A Case Study” has been carried out by Faria Haque Pushpo in the department of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna, Bangladesh. The above thesis work or any part of this work has not been submitted anywhere for the award of any degree or diploma.



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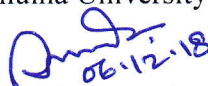
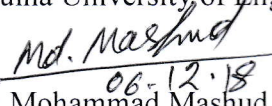

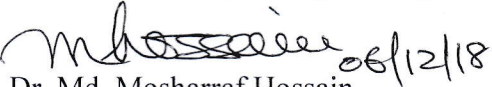


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## **ABSTRACT**

This paper represents a brief overview on the evaluation of qualitative and quantitative techniques in decision-making. The purpose of this study was to examine the status and extent to which administrators and engineers of Bangladesh apply qualitative and quantitative techniques of management in planning, directing, reporting and controlling activities for enhancing their administrative and operational decision-making capability. The study was directed to the top and operative organizational levels in two categories of administrators (executive and operative) 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 analyzed using statistics (mean and aggregated score) to describe administrator's decision-making capability in terms of extent of utilization of the selected techniques. Based upon this study's findings, practical implications are discussed. Limitations and suggestions also are made for future research into this topic.

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# CHAPTER 1

## INTRODUCTION

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### **1. 1 General:**

Decision-making is often referred to as the heart of the management/administrative process. Top management of various organizations should equip themselves with the knowledge of both quantitative and qualitative techniques, in order to make well-defined decisions for the development and growth of their organizations [68]. Effective decision making is crucial for survival of any organization. Organizations have to make decisions considering the limited amount of information. Decision making problems are divided into two types deterministic and probabilistic.

The energy sector is one of the most important in terms of economic growth across the world. Hence, electrical energy has become an important index of a country's economic and technological progress. The primary function of a power system is to provide electrical energy to its customers as economically as possible with an acceptable degree of quality. The consumption of power is steadily rising with the advanced technology and acceleration of the process of industrialization and urbanization. This makes necessary to maintain a continuous and almost instantaneous balance between production and consumption of electricity in power systems. Now administrators and engineers are focusing on applying quantitative and qualitative methods of management in decision making to increase the productivity and the efficiency for improving competitiveness.

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 [59]. The most important aspect of good modeling and analysis is to have a complete understanding of the engineering implications of the system.

In this paper we will introduce different quantitative and qualitative techniques of management and their applications used in decision making in Bangladesh power sector. The paper is based on quantitative and qualitative techniques of management and their application in case of decision making.

## **1.2 Background to the problem**

Victor Baldrige, a researcher on the administration of post-secondary organization, 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 should permit institutions to achieve greater efficiency and fairness in their internal operations. 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 [3].

Corson suggested that, in some respects, a closer approximation to business organizations could be healthy. 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 [1]. 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 [7]. 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 [18].

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 [33][44][6][35], organizational culture [31][16], structure and functional designs [33][39], productivity and participation [23][34], organization development, strategy, and change [24][25][26][27] and institutional effectiveness [37][32][14][43]. Many of these studies provided critical insights into organizing frames of reference for understanding the administration and administrative processes. 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 organizational areas, were limited in some respects.

Past research examined the role of quantitative methods in business management [19][20]. Surveys to identify the extent to which managers do, or do not, use quantitative techniques were reported [8][52][53][22][67][69]. Diverse quantitative models for education were developed and their implementation discussed [26][27], but, definitive research on the extent of the use of qualitative techniques in power sector administration/operation was minimal or non-existent.

### **1.3 Statement of the problem**

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. Human relations skills are certainly necessary, but, increasingly, they are not sufficient for managing complex organizations. Technical competence is also required for numerous and varied tasks. Activities that require scheduling, for instance, include 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. Ideally, during the last twenty five years, organizations have prepared numerous and capable specialists and professionals with the necessary skills to administer organizations 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. Power sector's administrators and operators are being particularly challenged by declining resources. An increasing number of administrative and operational problems 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 [61]. 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 [9]. 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 organizations of power sector. 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/operators 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/operator's judgment and experience; it includes the administrator's/operator'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 non-routine problems, or if a problem is sufficiently complex, then a quantitative analysis might be a very important consideration for the administrator's/operator's final decision-making. Quantitative analysis concentrates on the facts, data, or quantitative aspects associated with problems. An administrator's/operator's educational, and technical knowledge of quantitative procedures help to enhance the decision-making process. When using a quantitative approach, an administrator/operator will concentrate on and develop mathematical expressions that describe objectives, constraints, and other relationships that exist in the problem. Administrators and operators must recognize, adjust to, react to, and accommodate many diverse behavioral situations which permeate the power sector organization. Administrator's/ operator'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 [18]. It is the underlying premise of this study that the use of managerial aidboth qualitative and quantitative are of vital importance for a sound and effective decision making process. Decision-making is, in fact, psycho-technical [4]: 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.

## **1.4 Purpose and Objectives**

The main purpose of the proposed project is to examine the extent to which administrators and engineers adopt qualitative and quantitative managerial techniques in planning, directing, reporting and controlling in order to effectively enhance their administrative/operational decision making activities. Another purpose of this study was to answer questions about personal and organizational factors related to the propensity of administrators and engineers to adopt certain



qualitative and quantitative techniques for decision-making and administrative tasks. The specific objectives of this project are:

- i. To determine the specific qualitative and quantitative techniques that are commonly used in the decision-making and problem solving processes in power sector.
- ii. To evaluate the degree of familiarity of these techniques in administrative and operational environment.
- iii. To define levels or functional areas where those managerial techniques might have real or potential applications and may be used effectively.
- iv. 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 decision making processes in Bangladesh power sector.

Based on these objectives, 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.

## **1.5 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 administrator's/operator's position and the extent of use of some techniques in organizations of power sector 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 power sector, may provide valuable insights for designing future strategies to facilitate

the adoption of these methods and could enhance the administrator's/operator'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 Bangladesh power sector, administrators and operators are required to cope with the complexities of changing responsibilities. The findings of this study could also serve as feedback mechanisms about administrator's/operator's level of preparation to meet these challenges. Contemporary and future administrators and operators must possess the academic and experiential know-how necessary to understand the methods and technologies that they are managing. Administrators and operators 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 administrators and operators in developing their knowledge about qualitative and quantitative techniques, and about the ways these methods might be applied in their organizations to achieve positive results in improved decision-making.

## **1.6 Limitations of the study**

This investigation is limited to a few organizations. It did not include all the organizations of power 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 operational sub-systems in the selected organizations. 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 administrator's and operator's 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.

# CHAPTER 2

## LITERATURE REVIEW

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### 2.1 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 [38][40].
- **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 [57].
- **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 [45].
- **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.
- **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 [59].

- **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 objectives and criteria [59].
- **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 [45].
- **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 [60].
- **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 [46].

- **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 [42].
- **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 [45].
- **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 [11].

- **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 [46].
- **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.
- **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 [63].

- **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 [47]. 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 [62].
- **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 [30].

- **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):** 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 [15]. Program Evaluation Review Technique (PERT) is an evaluation application used to study more efficient ways of scheduling activities, further planning, and better control [17].
- **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 [41].

- **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 [55].
- **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 team work to achieve the mission of the organization following certain principles for continuum improvement. 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.

## **2.2 Review of literature**

During its evolution, administration has been recognized by practitioners and scientists as both an art and a science. The administrator as an artist tries to create new realities and to influence others. And the administrator as a scientist collects and analyzes information, assesses relationships, infers causality, and generates and tests hypotheses [21]. 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 [51].

Classical organizational thought, also called administrative management theory, started with scientific analysis of work and efficiency [2], and later dealt with concepts and principles of bureaucratic theory, such as hierarchical structure, authority, procedures, and rationality [36]. These concepts were integrated into the administrative functions of planning, organizing, leading, and controlling [50], and describing what administrators do and how they act today [59]. 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 [56]. 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 [62]. 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 [66].

Over the last 25 years, much work has been devoted to the construction of models to aid administrators and operators 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 also describes relevant approaches applied to different organizations, examines pertinent successful models that are used in diverse areas different organizations and the primary empirical research on the extent of the use of various qualitative and quantitative techniques in different kinds of organizations.

## **2.3 Approaches to Management**

Three of the four prevailing theories of organization and administration are the well-known bureaucratic, collegial, and political models [12]. 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 [12][13]. 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 as organized anarchy [44]. 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 organizations and the ideologies that shape management practice. 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 individuals the basic element for the decision-making process. Each frame

of reference leads to a different approach to management. Some organizations apply a pluralist ideology where individuals reflect different interests, aims, and forms of action. Administrators and operators 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/operators recognize the politics of an organization and accept their roles as agents having organizational power, and as arbitrators of conflict management. Few 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 organization. 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 [5][29]. 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 organizations are, and the understanding of the complex human interactions that are maintained in those organizations. 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 organizations. Regardless of the theoretical framework accepted by organizational administrators, both administration and management involve the coordination of human and material resources toward the effective accomplishment of organizational objectives. 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 this study and their primary applications to power sector organizations are discussed here.

## 2.4 Models Applied to different organizations

**Qualitative Techniques:** Force-field analysis as an intervention method for improving the organizational climate. 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. Force field analysis is a technique useful for diagnosing human resources development and training problems in organizations. 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 [65]. There are several standard 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 etc. The variable of managerial philosophy was assessed by five multiple choice managerial questions derived from theoretical framework of Theory X and Y assumptions. The study concluded that the most effective trainers were persons with a Theory Y orientation. 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. The researcher emphasized that theory X assumptions characterize today's predominant pyramid organizational structure. 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. Researchers presented the results of a national survey of institutions, seeking information about adoption of managerial techniques, specific statistical tools used, benefits, and frustrations, in which Total Quality Management (TQM) was applied. 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. In 1981 techniques were reviewed 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. The six management techniques were: use of statements of purpose, goal statements, written objectives, job descriptions, evaluation, and rewards. 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. 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 administrators focused on ways of describing particular categories of resources. Standardized definitions, categories, and data collection procedures were developed for facilities. The transformation of data into information, also called information analysis, was supported by management information system processes. Many operational problems, such as those found in resource allocation, financial planning, 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. There are fundamentally four reasons why quantitative techniques are used by managers. They are:

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

In quantitative decision-making problems, different kinds of formal mathematical and other types of models have been implemented. 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. Two models that have been frequently used: 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.

## **2.5 Empirical Research on Extent of Use**

After considering some of the qualitative and quantitative models implemented in different organizations, 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. 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 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. 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. The samples, methodologies, and findings of these studies were



different. 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 organizational needs of groups such as academicians and practitioners. 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/operator.

# CHAPTER 3

## Methodology

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### 3.1 The Methodology of the Study

In this study, a systematic approach is adopted to collect information during research. The step by step research methodology is given below:

- i. **Development of Questionnaire:** Research questionnaire was prepared to collect information through interview. The standard of questionnaire was kept in such a level that it might be helpful to achieve the objectives.
- ii. **Sampling:** The BPDB and WZPDCL was used as sample for data collection.
- iii. **Conducting Survey:** The developed questionnaire was be given to top level, mid-level and operational managers for primary data collection. The secondary data will be collected from the published literature of different power developing company of Bangladesh.
- iv. **Screening and analyzing:** The collected data was be screened to remove the inconsistency and then analysis of these data will be carried out to obtain the information related to our objectives.

### 3.2 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 and operators for use in their decision-making processes and tasks?
2. To what extent are administrators and operators 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 executive and operational 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 and functional levels (executive and operatives)?
5. What type of benefits do administrators and operators perceive from using qualitative and quantitative techniques in their decision-making processes?
6. What kind of constraints do administrators and operators commonly encounter in implementing qualitative and quantitative techniques in decision-making at colleges and universities?
7. Have the administrators and operators received organizational training in the selected techniques to enhance their decision-making processes?
8. How are selected administrator's and operator's personal and organizational 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 and operators an adequate level of education that supports the extent of use of behavioral and quantitative techniques at their organizations?
  - b. Have the administrators and operators adequate years of service or experience associated with the extent of usage of behavioral and quantitative techniques?
  - c. Are the administrators and operators 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 organizations or departmental units?
  - e. Are the administrators and operators using software packages and computer instruments for analyzing data or solving problems in their departmental units?

### **3.3 Population and Sampling**

In this study, only 2 power sector organization were involved: (1) Bangladesh Power Development Board, (2) West Zone Power Distribution Company limited. 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, the basis for stratification was the organizational setting involving the functional subsystem of operations. Accordingly, two organizations were 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” [54]. 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 organization. It was assumed that having at least a sample of three organization was sufficient for the purposes of this study. It was assumed that not all of the respondents would return the questionnaires.

### **3.4 Research Variables**

Another purpose of this study was to answer questions about personal and organizational factors related to the propensity of administrators/operators 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 2. 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 [48][49][58]. 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 [10].

### **3.5 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. 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. Using the basic theory of individual development, “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. Work experience is an important factor to be considered in the design and utilization of information technology in organizations. In this research, given the fine selectivity and level of competence required by administration in power sector, 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 [20][59]. For purpose of this research, conceptual skills involve viewing the organization as a whole and applying one’s planning and thinking abilities [59]. 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 [59]. Because every institution’s most valuable resource is its people, interpersonal skills are a part of every administrator’s/operator’s job, regardless of the level of authority or the functional area. Administrators/ operator’s 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. 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 administrator's 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. 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 checklists 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 administrator's work.

### **3.6 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 administrator's/operator's 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 administrator's 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.

### **3.7 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. 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). 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. 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 inquiries focused on the cognate information used to analyze administrators' abilities, skills, and the rational decision-making processes. This question (a through f) 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. Items in questions four and five, which concern benefits and obstacles encountered in using qualitative and quantitative techniques. 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. 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.

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. Then, in order to make the questionnaire simple and to improve the reliability of the study 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.

# CHAPTER 4

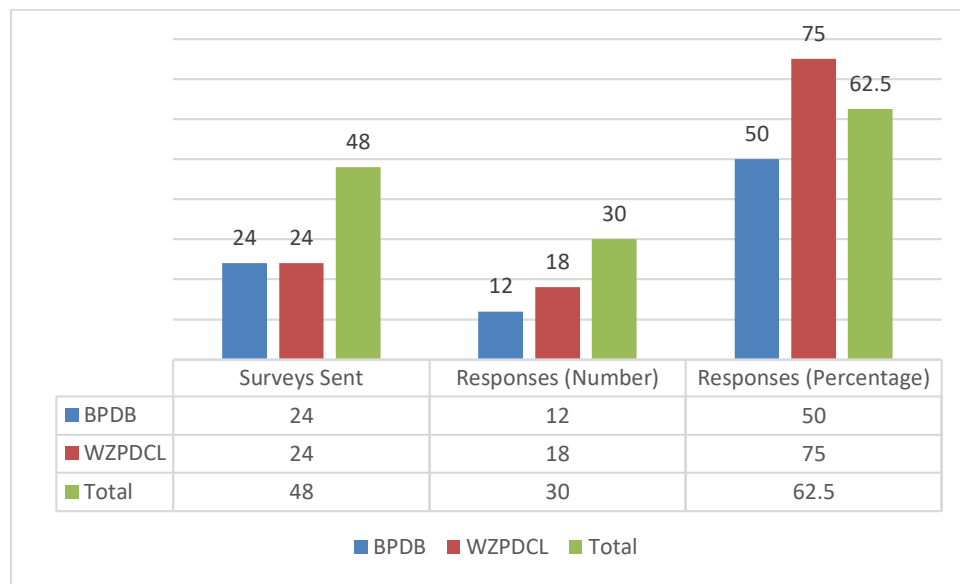
## RESULT DISCUSSION

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### 4.1 Respondents' Organizational and Demographic Information :

#### 4.1.1 Introduction:

The questionnaires were sent to 48 officers of two randomly selected organizations of power sector, where a total of 30 timely and usable questionnaires were returned. Fig. 4.1 outlines the organizations randomly selected for this study, the total number of organizational surveys sent to them, and their response rate of return. The overall response rate was 62.5% of the sample, shown in Fig-1 .



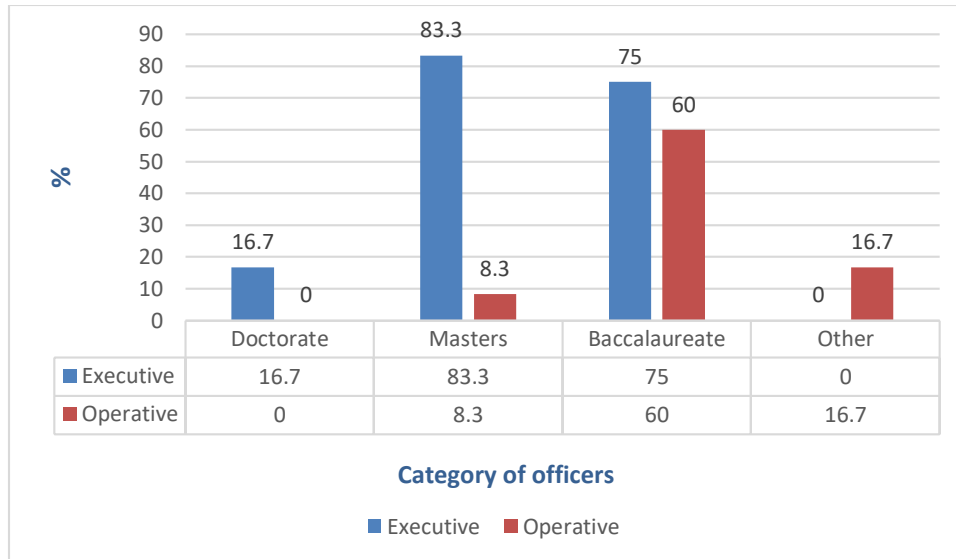
**Fig-4.1: Number and Percentage of Responses of organizations Surveyed**

#### 4.1.2 Education:

##### 4.1.2.1 Degree Levels Held by Officers :

Education is considered as an important factor for the evaluation of qualitative and quantitative techniques in decision making because decisions may vary with the officers of different educational level.

The variable education was measured through question asking respondents to provide the highest degree attained. Fig 4.2 indicates that 3.3 % respondents hold a doctoral degree, 23.3 % hold a Masters degree, 60 % hold a baccalaureate degree, and 13.3% were graduated in other categories of education.



**Fig-4.2: Number and Percent of Degree Levels Held by Officers (N=30)**

#### 4.1.2.2 Fields of Study:

The fields of study for degree of the respondents is considered for the study. The decision of officers receiving technical study varies from the decision of officers receiving general study.

The respondents' focus of education or field of study for the highest degree completed by administrators is summarized in Table 4.1, which shows that the highest frequencies of respondents by field of study are in Technical area, composed of 86.6 %.

**Table 4.1: Number of Administrators by Fields of Study (N=30)**

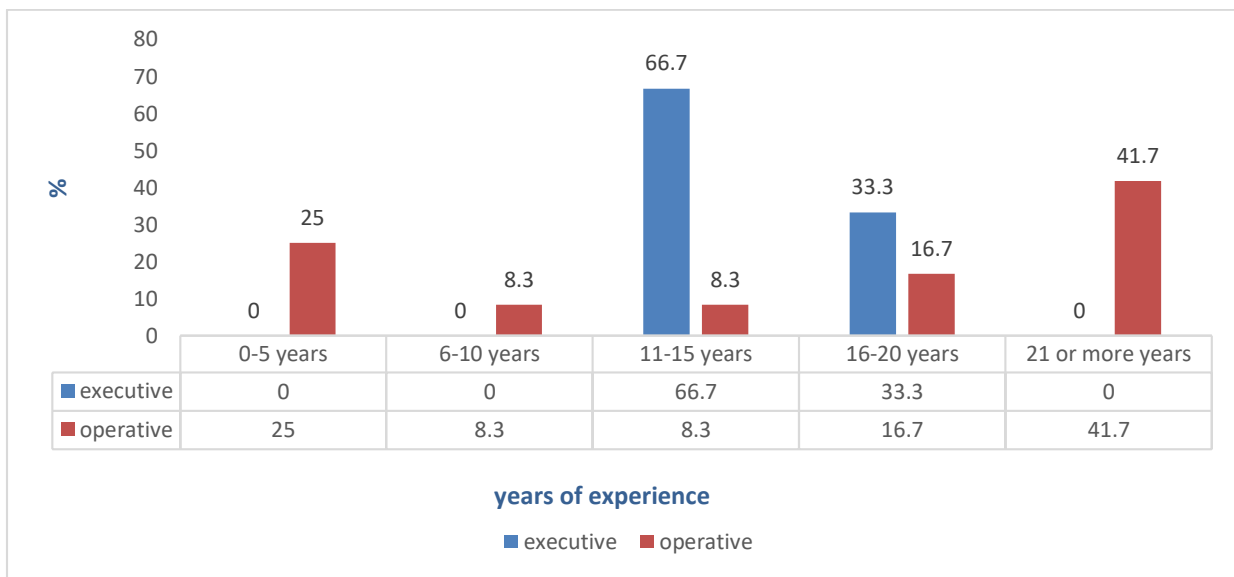
Fields of Study for Degree	Category of officers	
	administrative	Operative
Technical	4	22
General	2	2
Total	6	24

### 4.1.3 Experience:

#### 4.1.3.1 Percent of Respondents by Years of Experience:

Years of experience are considered for the analysis of different decision-making techniques, because decision-making techniques of an experienced respondent must be different from that of a fresher.

Fig 4.3 presents the length of the respondents' organizational experience. This figure recognizes that the respondents' total frequency by level is distributed evenly in the different five-year intervals utilized to measure experience. Table shows that 41.7% respondents have held their positions between 21 or more years.

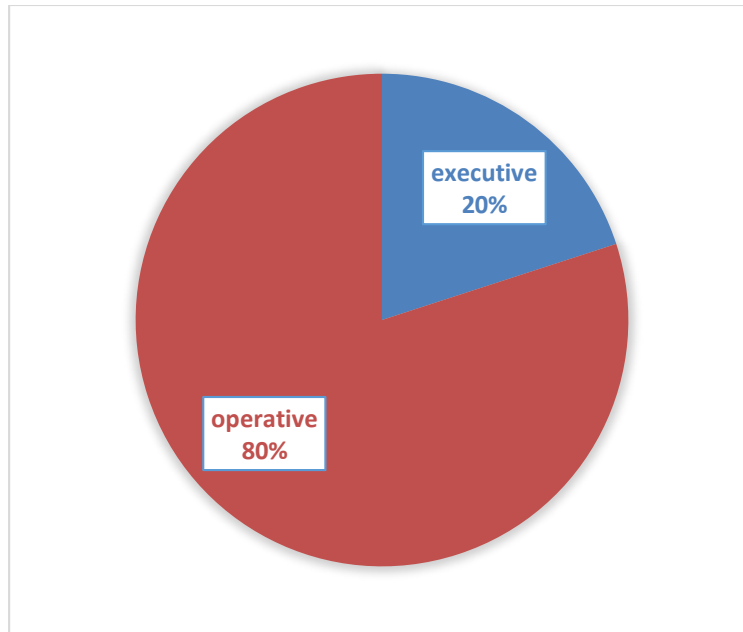


**Fig-4.3: Percent of Respondents by Years of Experience**

#### 4.1.3.2 Average of experience of officers:

Additional details about the management experience average of each category of officers is calculated and it is shown in fig 4.4.

However, when an average of experience was analyzed for each categorical group, in their respective executive and operative functional levels, the management experience average was 20% & 80% respectively.

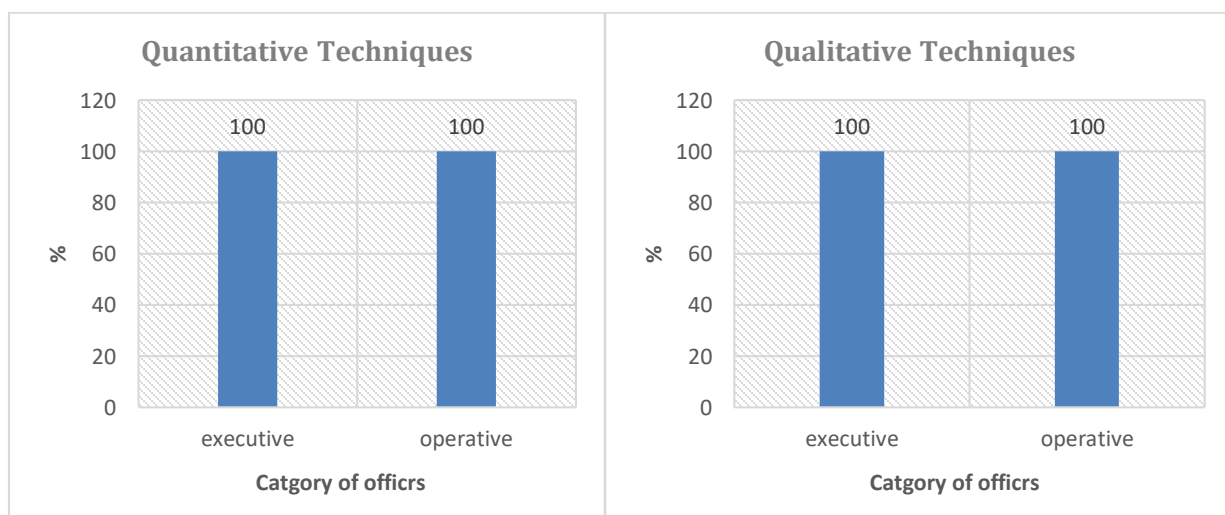


**Fig 4.4. Average of experience of officers (N=30)**

#### **4.1.4 Training:**

Training plays an important role for skill development. Respondents having training on qualitative and quantitative techniques in decision-making have the ability to take decisions rationally as well as more accurately.

Fig-4.5 shows that 100% of the respondents had received training in qualitative and quantitative techniques. 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.

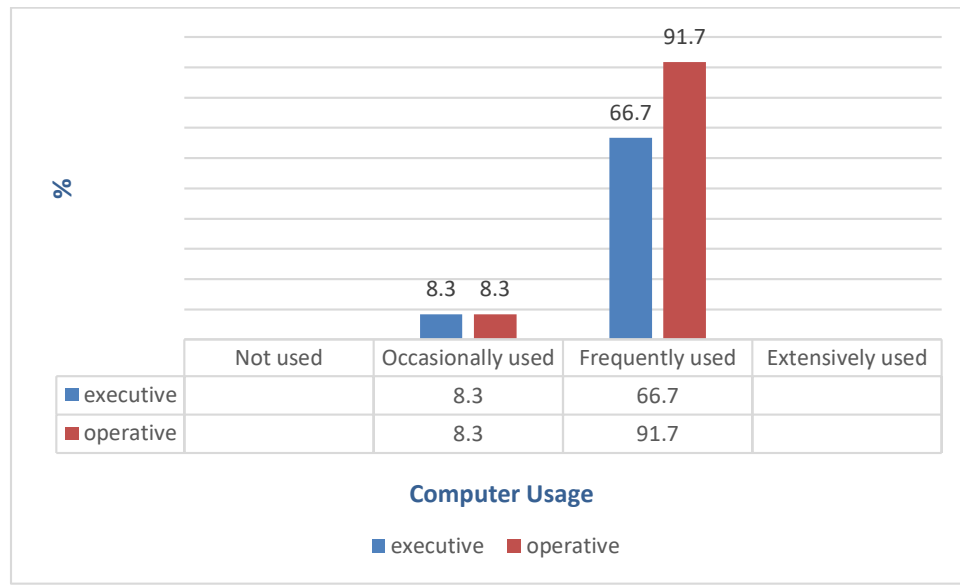


**Fig-4.5: Respondents Received Training in Qualitative and Quantitative Techniques**

### 4.1.5: 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.

Fig 4.6 shows that 86.7% of the respondents “frequently” use the computer for decision-making, and 13.3% of them “occasionally” use the computer for assistance in the decision-making process at the departmental level.

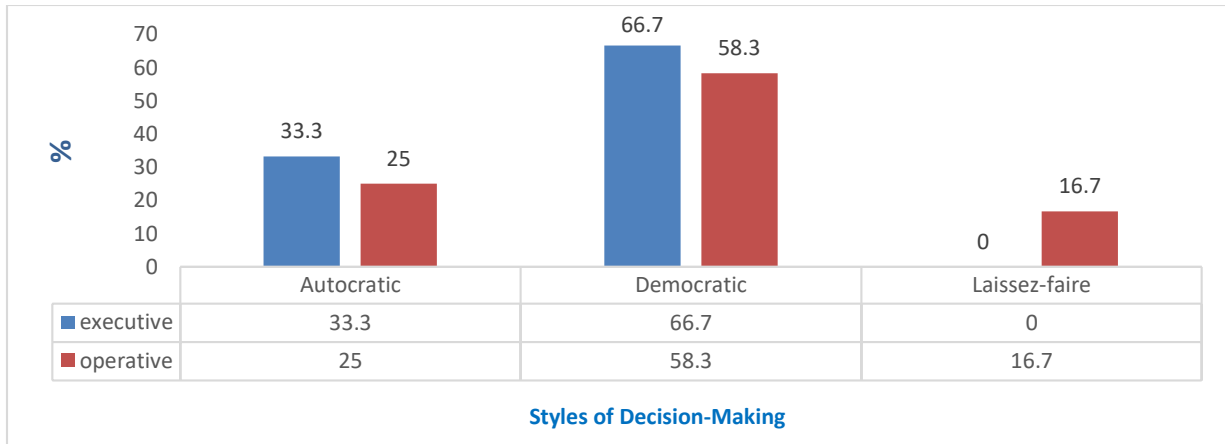


**Fig-4.6: Percent of Respondent for Computer Usage at the Departmental Level**

### 4.1.6 Perceived Style of Decision-Making:

The questionnaire asked about three different styles (Autocratic, Democratic, Laissez-faire) of decision making experienced at the organizational 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.

Fig-4.7 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.



**Fig-4.7: Percent of Respondent Styles of Decision-Making at the Organizational Level (N=30)**

## 4.2 Statistical Analysis of the Primary Research Questions:

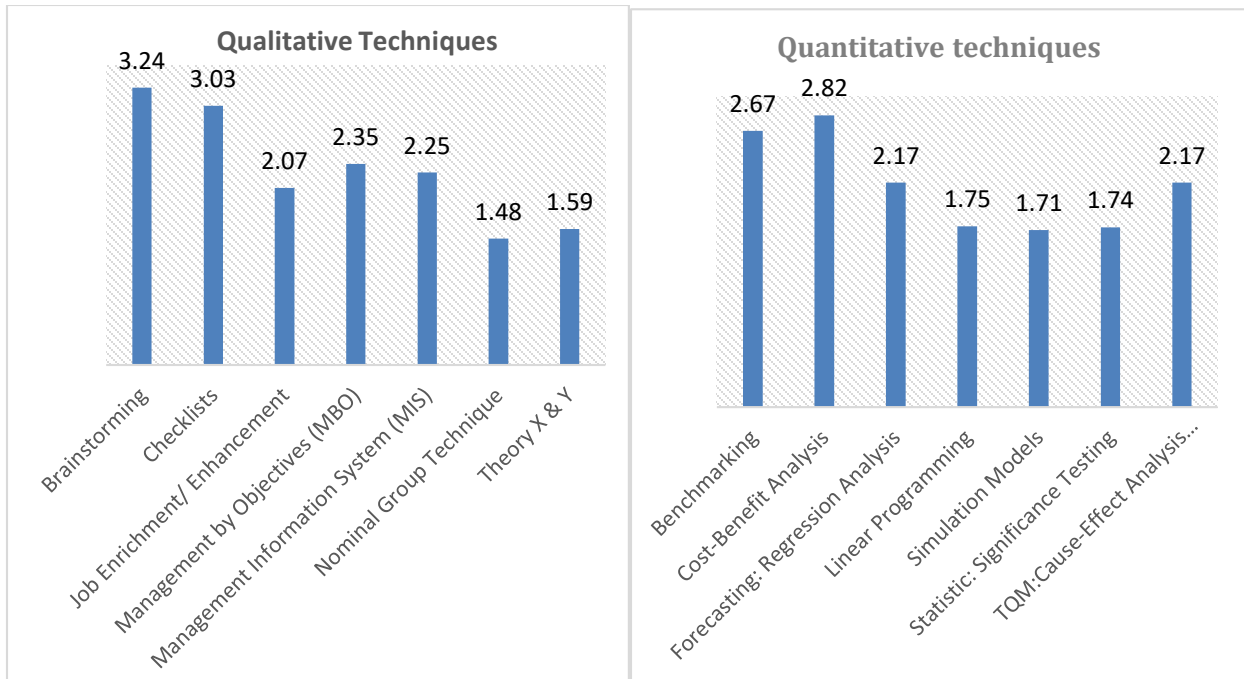
### 4.2.1 Degree of Familiarity:

Degree of familiarity is considered as an important factor for the evaluation of qualitative and quantitative techniques in decision-making process. The research question about the degree of familiarity was sent to the respondents to identify the percent and ranking of responses on degree of familiarity.

#### 4.2.1.1 Percent of Responses Related to Degree of Familiarity:

The research question was concerned with the degree of familiarity with the qualitative and quantitative techniques used in the decision-making process. The familiarity variable was measured on a four-point Likert scale, ranging from (1=not familiar) to (4=very familiar or expert).

Fig-4.8 summarize the total number and percentage of responses to the questionnaire that indicated the level of familiarity with each technique.



**Fig-4.8: Percent of Responses Related to Degree of Familiarity with Qualitative & Quantitative Techniques (All Respondents)**

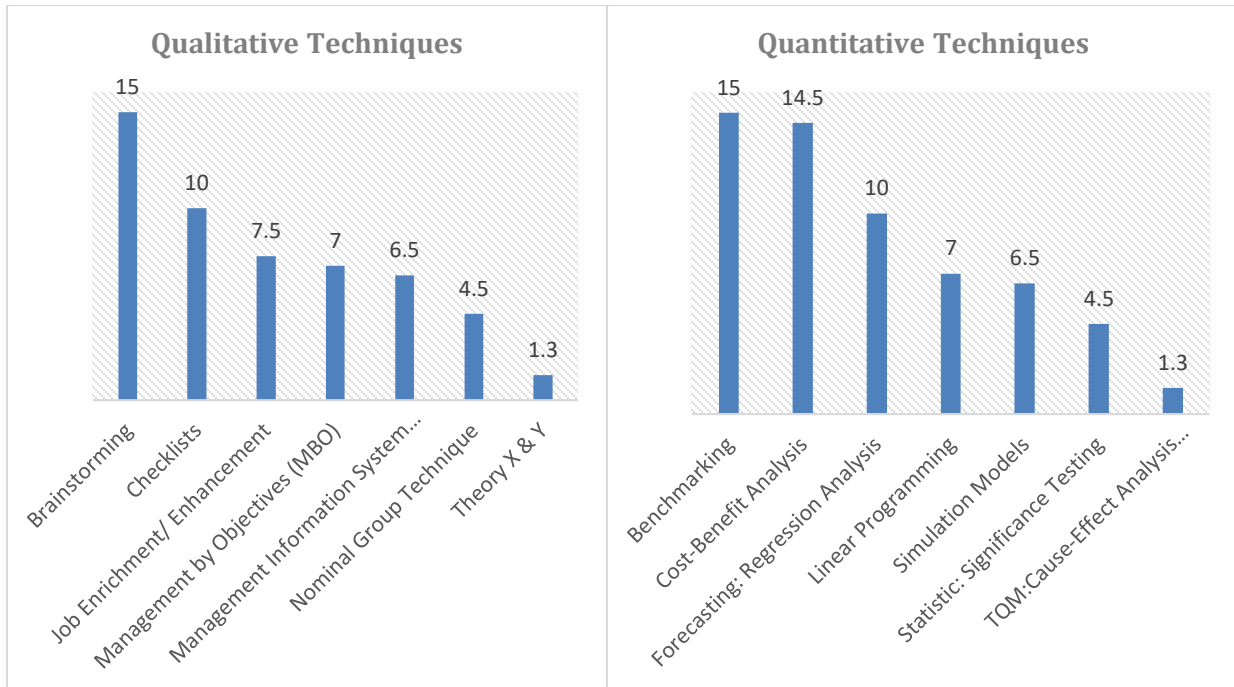
#### 4.2.1.2 Ranking of Responses on Degree of Familiarity:

An aggregated score and a mean for each technique were computed to facilitate their ranking. The purpose of using this technique was to weigh the frequency according to the respondent's degree of expertise in each methodology.

Brainstorming ranked first among of the qualitative techniques and Cost-Benefit Analysis ranked first among of the quantitative techniques. The mean value of rank 1 for both quantitative and qualitative technique was 15.

Fig-4.9 summarize the ranking of responses on the degree of familiarity with each technique of both quantitative and qualitative techniques.





**Fig-4.9: Ranking of Responses on Degree of Familiarity**

## 4.2.2 Extent of Use of the Techniques:

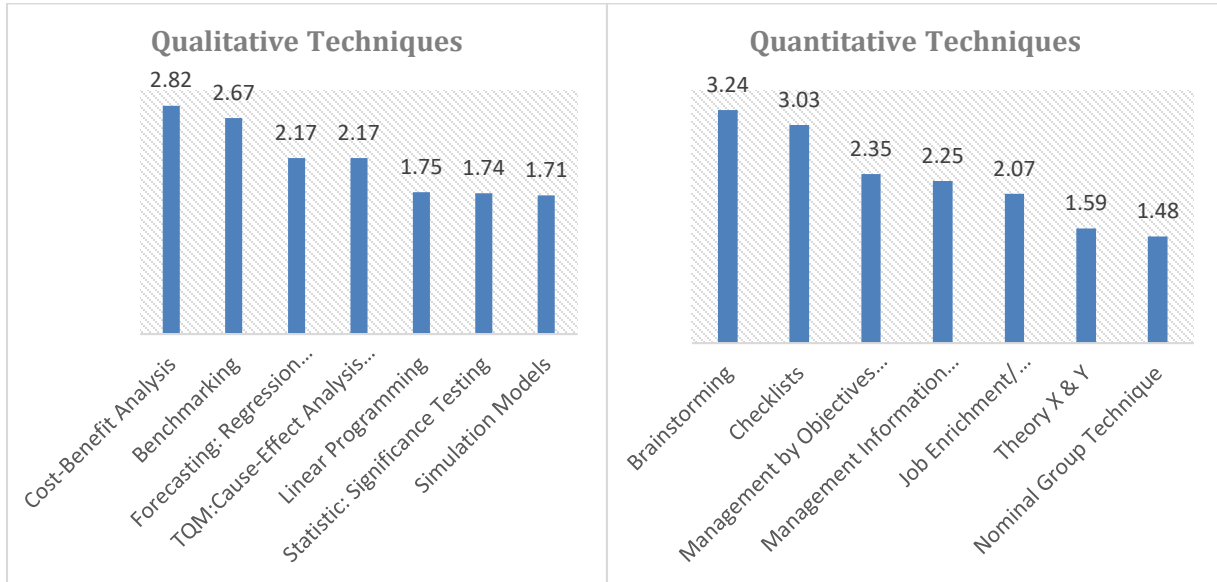
For the purpose of this research, the extent of use involved the ability to apply specific qualitative and quantitative techniques in the planning, directing, reporting, and controlling functions. The questionnaire was organized to evaluate the administrators' opinions about the extent of use of the 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.

### 4.2.2.1 Extent of Use of the Techniques in Planning:

From the total number of responses related to the extent of use of qualitative and quantitative techniques in planning activities it can be noted that, 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. 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.

Fig-4.10 summarize the rank order of responses on the extent of use of qualitative and quantitative techniques in planning activities.



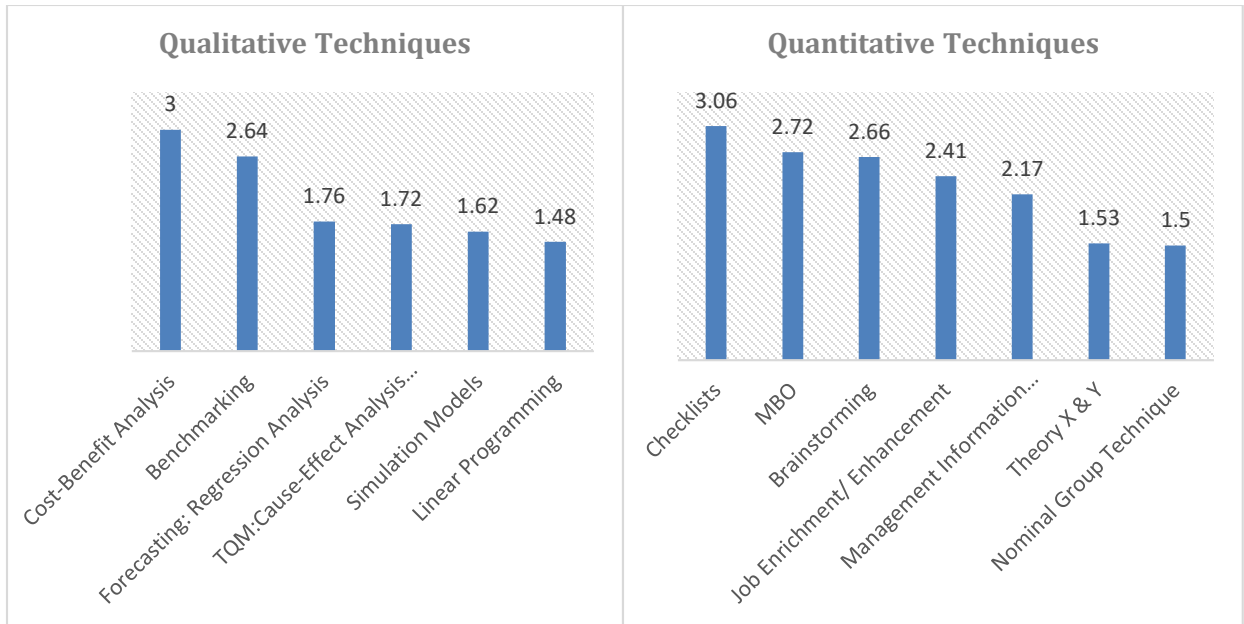
**Fig-4.10: Extent of Use of Qualitative Techniques in Planning Activities**

#### 4.2.2.2 Extent of Use of the Techniques in Directing:

The aggregated score for each technique and each function for the extent of use of qualitative and quantitative techniques in directing activities 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.

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.

Fig-4.11 summarizes the ranking of responses to extent of use of qualitative and quantitative techniques in directing activities.



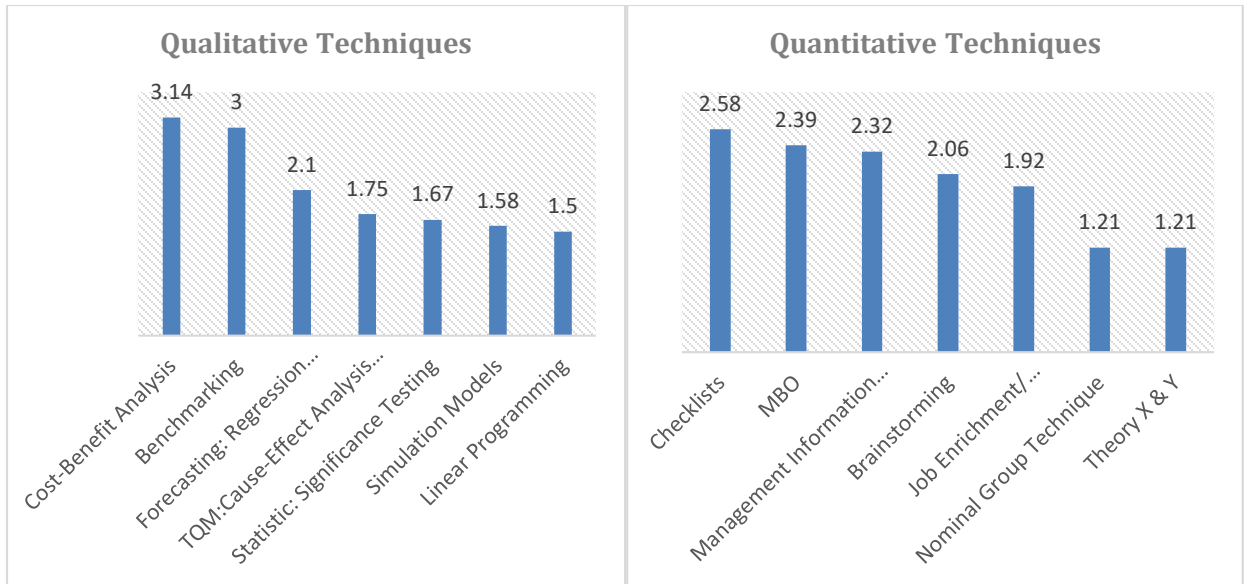
**Fig-4.11: Extent of Use of Qualitative Techniques in Directing Activities**

#### 4.2.2.3 Extent of Use in Reporting:

From the number of responses and the ranking of responses to the extent of use of qualitative and quantitative techniques in reporting activities. It is detailed 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.

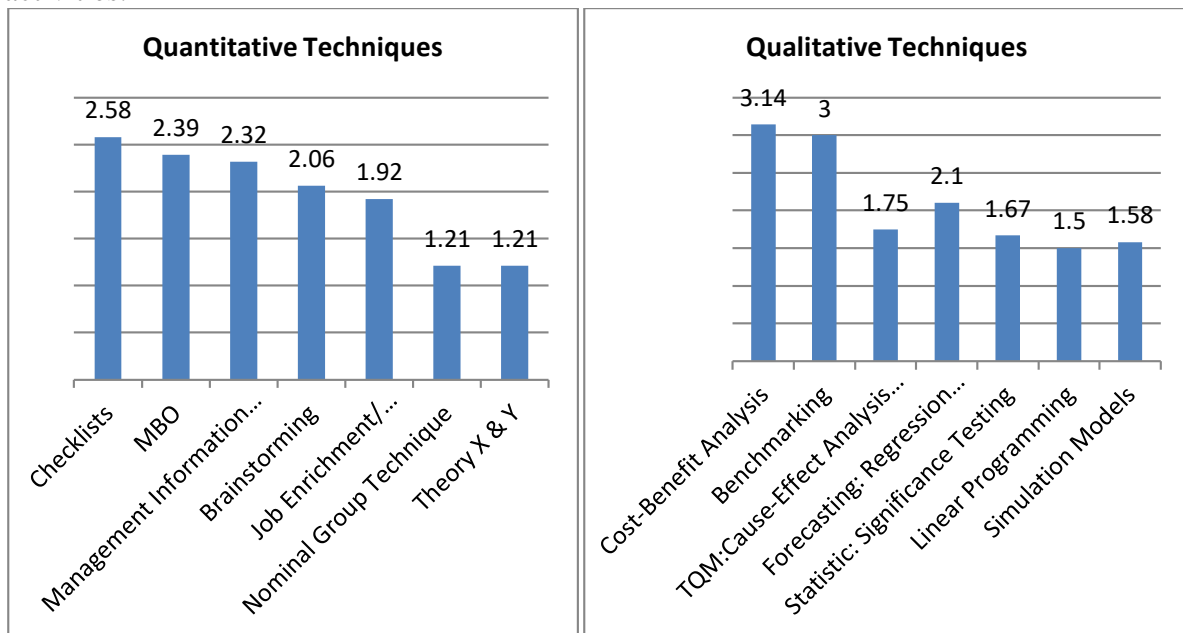
Fig-4.12 summarize the ranking of responses to the extent of use of qualitative and quantitative techniques in reporting activities.



**Fig-4.12: Extent of Use of Qualitative Techniques in Reporting Activities**

#### 4.2.2.4 Extent of Use in Controlling:

Fig-4.13 show the number of responses to the extent of use of qualitative and quantitative techniques in controlling activities. These tables show 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.

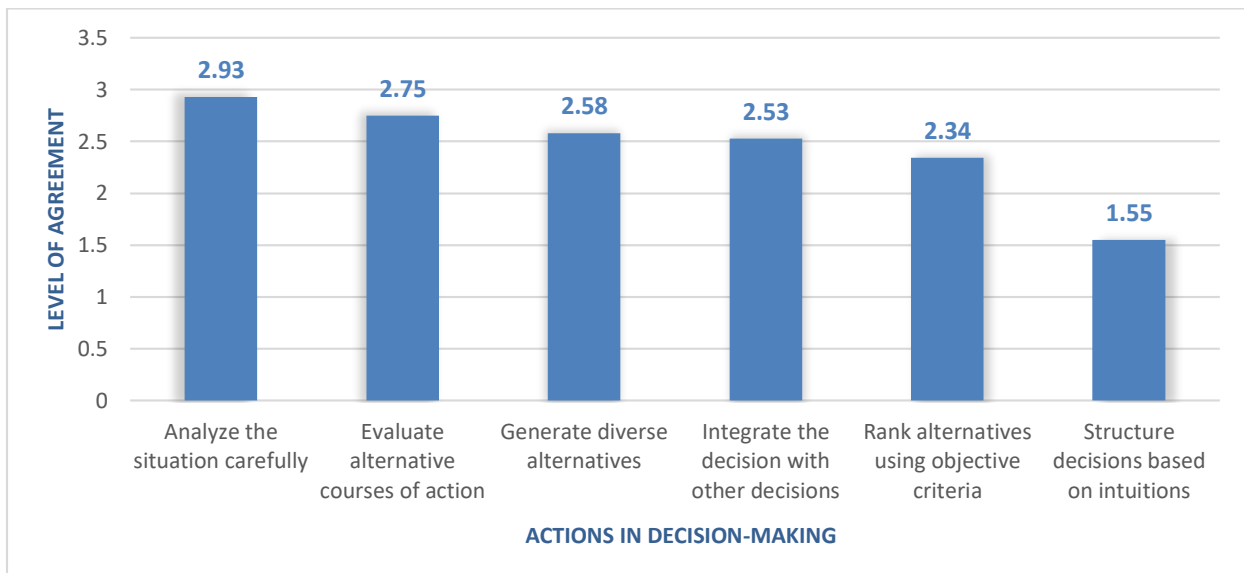


**Fig-4.13: Extent of Use of Qualitative Techniques in Controlling Activities**

### 4.2.3 The Rational Decision-Making Process:

The questionnaire contained 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 different possible actions. Questions were used to explore respondents' conceptual skills with the use of a rational process of decision-making and interpersonal managerial skills.

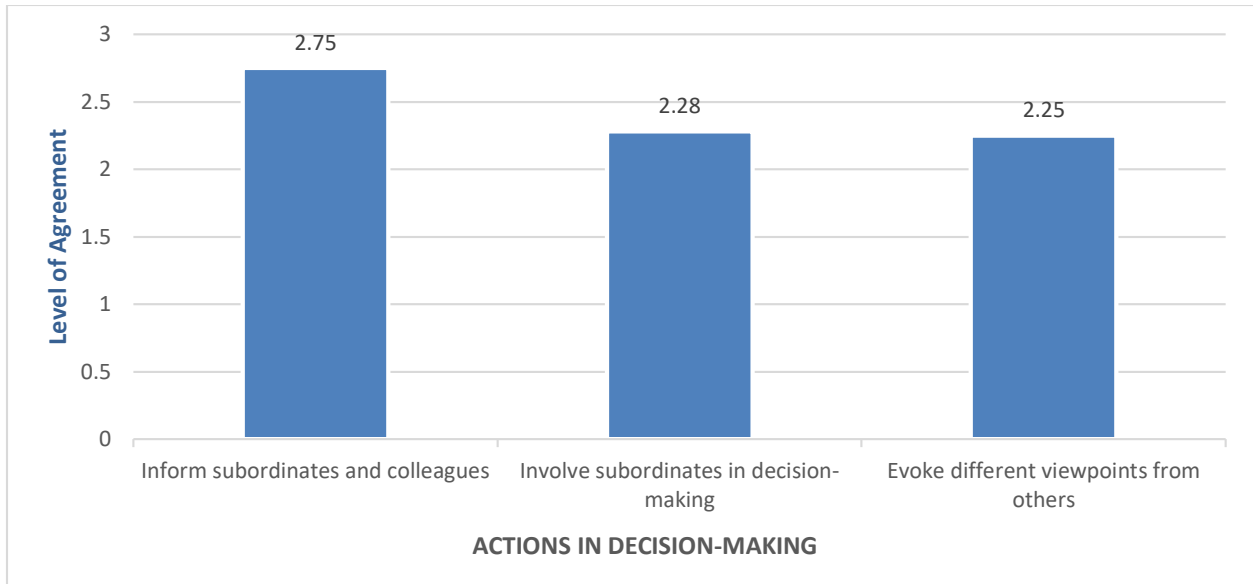
As can be seen in Fig-4.14, respondents ranked the diverse actions in a logical and rational order that permitted them to think in terms of relative priorities, rather than ironclad objectives and criteria. This behavioral mode of thinking suggests that the respondents are skilled at conceptualizing how organizational or departmental changes may affect their department.



**Fig-4.14: Ranking of Responses Related to Decision-Making Actions to Take in Important Organizational and Departmental Problems**

Fig-4.14 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. Fig-4.14 also 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. This suggests that administrators prefer applying specific procedures and techniques and do not rely solely on intuition for problem-solving.

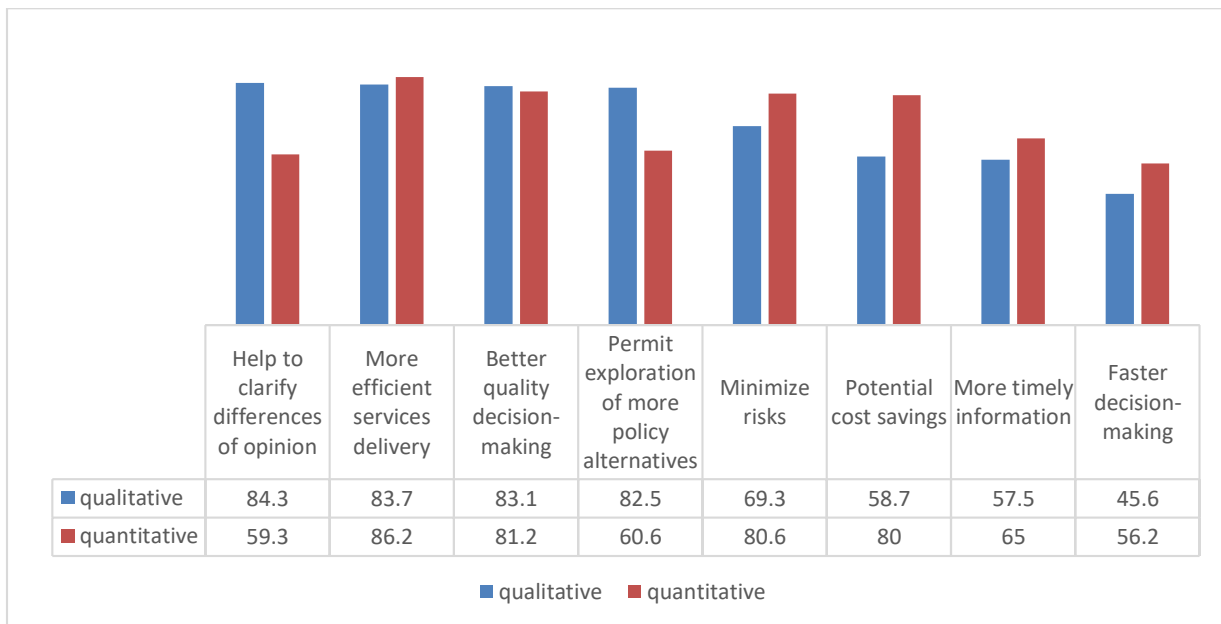
Fig-4.15 indicates the ranking of responses related to this type of performance. This figure suggests that administrators have excellent interpersonal skills, and encourage participation in the decision-making process.



**Fig-4.15: Ranking of Responses Related to Decision-Making Actions to Take in Important Organizational or Departmental Problems Involving Interpersonal Skills**

#### 4.2.4 Benefits in Applying the Techniques:

The questionnaire was concerned with several benefits that are reported in the literature and are derived from using both qualitative and quantitative techniques. Fig-4.16 details the percentage of the total responses related to eight derived benefits in applying qualitative techniques in the departmental unit.



**Fig-4.16: Percentage of Total Responses Related to Eight Derived Benefits in Applying Qualitative Techniques in the Departmental Unit (N=30)**

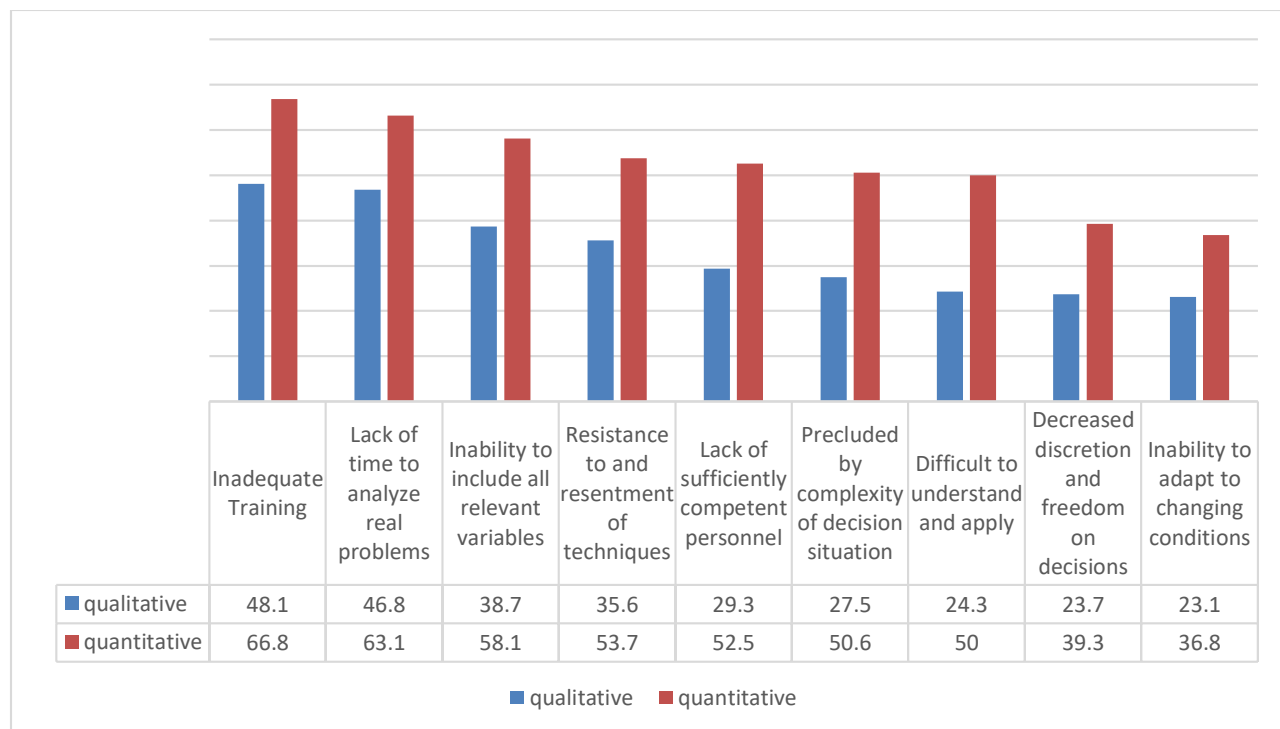
Respondents were given a list of eight potential benefits, and were asked to indicate what benefits their department derives from using qualitative and quantitative techniques.

As can be noted, the statement “help to clarify differences of opinion” (84.3%) was the most often reported benefit gained from using qualitative techniques. Another three selected statements about benefits exceed 80% of the opinions. They were “more efficient services delivery,” “better quality decision making,” and “permit exploration of more policy alternatives.” Concerning the quantitative techniques, the first marked benefit was “more efficient services delivery” (86.2%). “Better quality decision-making” and “minimize risks” were claimed as benefits by 81.2% and 80.6% of the respondent users. To a considerable extent, the three top-ranked benefits are in agreement with the findings reported that quantitative techniques are important in decision-making processes.

#### 4.2.5 Obstacles to the Use of the Techniques:

The questionnaire included several statements related to presumed managerial obstacles to using the techniques. It can be noted in fig-4.17, 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.

Fig-4.17 reports the percentage of the total responses related to the nine constraints that were selected by the respondents concerning qualitative techniques.



**Fig-4.17: Percentage of Responses Related to Nine Presumed Constraints in Applying Qualitative Techniques (N=30)**

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%) and “inability to include all relevant variables” (38.7%). The fourth most reported obstacle was “resistance to and resentment of the techniques” (35.6%).

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. In case of quantitative techniques, the statement “Inadequate training” is by far the overriding impediment, identified by 66.8% 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%) and “inability to include all relevant variables” (58.1%). The fourth most reported obstacle was “difficulty to understand and apply” (53.7%).

### **4.3 Discussion:**

The findings show that respondents have high levels of education and accumulated experience in their 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 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. The results imply that respondents hold a greater preference for qualitative than quantitative techniques in managerial applications.

Another major finding of this study was that the respondents hold a positive perception about the values of using qualitative and quantitative managerial techniques. 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. 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.



# CHAPTER 5

## CONCLUSION

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### **5.1 Conclusion:**

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 administrator's 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 system.

Administrators/operators may enhance decision-making capabilities by learning more about quantitative methodologies, and by better understanding their contributions to the decision-making process. An administrator/operator 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.

### **5.2 Scope of future work:**

Studies of qualitative and quantitative methodological initiatives cannot be isolated from day-to-day organizational operations. 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.

A more detailed investigation is needed about types of challenges faced by 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 power sector.

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 power sector?
- b) How are organizational changes perceived by others in organizations of power sector?
- c) What can 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 power sector?

It would be interesting to design a more detailed investigation only in management skills of administrators at the operative level, especially the department chairs, in the organizations of power sector 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 organizational top management can support others' development and about how organizations can facilitate training and development.

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# APPENDIX-A

## The Survey Instruments

**Prepared for the Project work for M.Sc Engineering Degree**

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

2. Please indicate the extent of use for you or members of your staff in each of the following qualitative and quantitative techniques in PLANNING, DIRECTING, REPORTING, and CONTROLLING activities by checking the response options 1, 2, 3, or 4 in each category.

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

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

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



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

<b>DECISION MAKING TECHNIQUES</b>	<b>CONTROLLING</b>			
<b>QUALITATIVE</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Brainstorming				
Checklists				
Job Enrichment/Enhancement				
Management by Objectives (MBO)				
Management Information System (MIS)				
Nominal Group Technique				
Theory X & Y				
<b>QUANTITATIVE</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
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	
	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		

<b>BENEFITS</b>	<b>QUANTITATIVE</b>	
	<b>YES</b>	<b>NO</b>
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.

<b>OBSTACLES</b>	<b>QUALITATIVE</b>	
	<b>YES</b>	<b>NO</b>
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		

<b>OBSTACLES</b>	<b>QUANTITATIVE</b>	
	<b>YES</b>	<b>NO</b>
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

Please indicate the impacts of ICT on the use of quantitative techniques in small scale business in marketing, advertising, packaging, assembly financial decision by checking the response options 1, 2, 3, or 4 (see enclosed Glossary of Terms for the definition of each technique).

1 = Undecided, 2 = No impact, 3 = Little impact, 4 = Great impact

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

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

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 organizations 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 administrative ( ) or operative ( )

12. How long have you been in your organization :

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).

_____ Engineering	_____ Accounting
_____ Computer Sciences	_____ Economic
_____ Business	_____ Mathematical
_____ Social Sciences	_____ Law
_____ Management	_____ Humanities
_____ Physical Sciences	_____ Other