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The characteristics of software engineering managers

Nazelrod, Gary, M.S.

The American University, 1988

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To Sandy, Julie, and Mike

THE CHARACTERISTICS OF SOFTWARE
ENGINEERING MANAGERS

By

Gary Nazelrod

ABSTRACT

This thesis is an analytical study that investigates the characteristics of software engineering managers, their training, and their background, and relates these factors to their effectiveness. This thesis develops and uses two questionnaires to collect the necessary data from entry level managers and their subordinates. A portion of the questionnaires is the Keirsey Temperament Sorter, which is an implementation of the Jung theory of type. This thesis concludes from the collected data that software engineers promoted into supervisory positions lack needed training to perform their jobs effectively. This thesis further concludes that there are differences in the personality type of software engineers and software engineering managers.

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I wish to acknowledge and thank Dr. Levinson, Dr. Boynton, and Dr. Yin. They provided excellent guidance and support to make this study successful. Many thanks to Nina Allen and Jean Belnap for all of their administrative assistance. I wish to thank all of the people who so promptly and thoroughly responded to my questionnaires. They provided an overwhelming response rate of seventy-eight percent. I am forever indebted to my wife Sandy, my daughter Julie and my son Mike for all the sacrifices they have made and the lonely evenings and weekends they have endured for me to complete this course of study.

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CHAPTER I

PURPOSE AND ORGANIZATION

Introduction

This thesis is an analytical study. The focus of the study is the extent to which personality characteristics and training influence the effectiveness of software development managers.

This thesis will investigate whether people with strong technical backgrounds and interests become good managers. The technical people and managers to be considered in this thesis are in the software development area. These people are employed in positions such as software engineer, systems analyst, and programmer. Software development is a fast growing industry. As a result, new managers are rapidly being promoted from the ranks of the technical staff.

Objectives

The principal objective of this thesis is to show that current practices of promotion and training are not conducive to the development of good managers. The approach of this thesis is to investigate the personality characteristics and training of software development

managers, and to look for correlations between personality characteristics and training and the effectiveness of these managers. This study will analyze the personality characteristics of software development managers and their staff. It will investigate the correlation between the personality characteristics of managers and their staff workers.

Context and Importance of The Study

The software development industry is a growing industry. It is plagued with problems such as cost overruns and delayed deliveries. Effective managers play an important role in the resolution of the problems.

The growth of the software development industry is due to a large demand for new software for both industrial and military use. The Electronic Industries Association projects that the demand for mission-critical software by the Department of Defense will grow from \$5-6 billion in 1982 to over \$32 billion annually by 1990¹.

Program managers are often confronted with a very subtle systems-engineering problem. Over the last 20 years, there has been a fundamental reversal in the roles of the computer software and hardware. For example, software embedded in the electronic weapon system has moved from the role of the servant to that of the master, and computer hardware distributed throughout a system can often be best understood as the hardware tools necessary to enable the software instructions to be carried out. This notion has not been lost on the military managers. For example, the World Wide Military

¹Electronic Industries Association, Government Division DoD Digital Data Processing Study, October 1980.

Command and Control System (WWMCCS) Information System (WIS) Joint Program Office (WIS JPMO) has decided on a software-first vis-a-vis a hardware-first acquisition strategy.²

Due to the continued growth of the software industry, there is a demand for both software developers and software development managers. There is also a need to increase the productivity in the software industry as a whole. Simply increasing the size of the work force will not solve the problems.

Hypothesis

In order to meet the objectives of this thesis, the following hypotheses have been developed. The study expects to show that the null hypotheses should be rejected and the rivals accepted.

Hypothesis 1. The training and experience of software developers is sufficient to allow these persons to perform their jobs as managers effectively. Rival: The training and experience that contribute to the development of a good software developer is not sufficient for him or her effectively to perform the job of software development manager.

Hypothesis 2. Software development companies promote people into management positions based on how well the people suit the needs of management positions. Rival:

²Colonel Kenneth E. Nidiffer, USAF, "The Personality Factor: Software Technology and the 'Thinking Styles' of Program Managers" Program Manager, July-August 1984, p. 10.

Software development companies use current technical performance as a major criterion for promotion to a management position.

Hypothesis 3. The personality characteristics exhibited by software developers are also exhibited by software development managers. Rival: The personality and characteristics of software developers and software development managers are quite different.

Scope of the Study

This study was conducted using the literature review to provide 1) historical background for the subject matter 2) a framework on which to build the data collection and analysis.

Limitations

To help provide focus for this thesis, the level of managers studied is limited. Only the lowest level managers are studied. By looking at only one level of manager, the study avoids the complexities of analyzing and comparing varying levels of responsibilities. Looking at multiple management levels would require a prohibitive amount of data to be collected and analyzed in order to draw any conclusions. A more thorough handling of the one level is considered preferable for this thesis.

This thesis is concerned with the software development work force only in a limited sense. The work force is used

to provide a basis for analysis by the Keirsey Temperament Sorter and for a validation of the data collected from managers. This thesis will not attempt to study how well or how poorly the software development work force performs its job. Also, this thesis will not address the need for increased productivity.

This thesis collects data only at one point in time. Data are not collected over a period of time, three to five years for example. Since this thesis does not collect historical data, it can only evaluate the current state. It cannot do any evaluation of trends.

Assumptions and Definition of Terms

Assumptions

Personality and *characteristics* are very broad terms. In order to deal with these concepts adequately their scope must be limited and defined. This thesis makes the assumption that the relevant aspects of personality are embodied in the theory of type³. This thesis uses the Keirsey Temperament Sorter⁴ as an instrument to measure type. Details of the theory of type and the Keirsey Temperament Sorter can be found in chapter II.

³Carl Jung, Psychological Types, rev. R. F. C. Hull, trans. H. G. Baynes (Princeton: Princeton University Press, 1971).

⁴David Keirsey and Marilyn Bates, Please Understand Me, 4th ed. (Del Mar, CA: Prometheus Nemesis Book Company, 1984).

Definition of terms

Bimodal: Bimodal means to have two modes. Data are said to be bimodal if there are two separate and distinct peaks in the data.

Chi-Square: The Chi-Square test is a test that compares two distributions.

Mean: The arithmetic mean is the sum of the data divided by the number of data items. This is the most commonly used definition of average.

Median: The median is the middle value of the data. Half of the data are less than or equal to the median and half are greater than or equal to the median.

Mode: The mode is the most commonly occurring value of the data.

Normal Distribution: The variation in a large amount of similar data is usually a normal distribution. The graph of a normal distribution looks like a bell.

Section Leader: Section Leader is the title of the lowest level of manager at the company where the data for this thesis was collected. The section leader is the only level of manager studied in this thesis. The normal size of a section is from three to seven people.

Section Member: The people who perform the work and report to the section leader are called section members.

Skewness: Skewness is a measure of the symmetry of data. Data are positively skewed if there is some chance of

large positive deviations from the mean. Data are negatively skewed if there is some chance of large negative deviations from the mean.

Standard Deviation: The standard deviation is a measure of the dispersion of the data.

Organization of the Study

This study is divided into the following chapters.

Chapter I

Chapter I provides an introduction to this study and the statement of its goals.

Chapter II

Chapter II provides a review of the current literature. It summarizes some of the studies that have investigated the characteristics of software managers. It also provides an explanation of the Keirsey Temperament Sorter and the Myers-Briggs Type Indicator instruments which are used to categorize the personality data of this study.

Chapter III

Chapter III discusses the development of the study. The data collection instrument is explained. The methods and techniques used for analysis are explained.

Chapter IV

Chapter IV discusses the analysis performed and results of the study.

Chapter V

Chapter V discusses the conclusions that the study has drawn from the data collected and analyzed. It also covers need for further research stemming from this study.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The purpose of this chapter is to give an overview of the literature that has been useful in the development of this thesis. The chapter focuses on several studies related to the subject of this thesis; and then highlights additional literature that has a bearing on this study.

Thomas Rand conducted a study investigating the characteristics of good data processing (DP) managers.¹ John J. Gabarro conducted a study of the process of new managers taking charge.² Isabel Briggs Myers' authoritative work on the Myers-Briggs Type Indicator will be explained.³ David Keirsey developed the Keirsey Temperament Sorter⁴ which is similar to the Myers-Briggs Type Indicator but which is simpler to use. Several studies using either the

¹Thomas M. Rand, "How to Be a Better Data Processing Manager" MINI Magazine, February 1984, pp.12-25.

²John J. Gabarro, "When a new manager takes charge" Harvard Business Review 3 (May-June 1985) : 110-23.

³Isabel Briggs Myers, The Myers-Briggs Type Indicator (Palo Alto, CA: Consulting Psychologists Press, 1962).

⁴Keirsey

Keirseley Temperament Sorter or the Myers-Briggs Type Indicator in software development settings are reviewed.

Characteristics of Good Managers

There have been studies addressing the characteristics of good managers. Rand's 1982 study⁵ addresses four major questions concerning data processing (DP) managers. These four questions are:

1) How do data processing managers compare with non-DP managers in terms of relevant managerial characteristics and attributes?

2) What specific characteristics are associated with highly effective data processing managers in contrast with their less effective colleagues?

3) What characteristics do effective data processing managers share in common with other successful managers in non-DP environments?

4) Are there any specific attributes or qualities which effective data processing managers need to acquire in addition to those exhibited by successful managers in non-DP environments?

Rand concluded that there are six critical characteristics that highly effective DP managers share in common with highly effective managers in non-DP environments. The six critical characteristics are: "enjoy

⁵Rand

leading," "clear expectations," "high standards," "empathy," "track performance," and "let them know." In addition, he concluded that there are five other specific characteristics that effective DP managers possess. These five characteristics are: "democratic approach," "team spirit," "future orientation," "flexibility," and "can deal with people."

This thesis will use these characteristics that Rand has emphasized as a basis for determining which managers that were investigated in this study are effective managers.

The importance of the characteristic, mentioned by Rand, "can deal with people" can be demonstrated by other literature. Albert LeDuc Jr. has this to say about the expectations for a computer services manager.

A computer services manager may be expected to be a planner, counselor, technical expert, administrator or crisis manager, simultaneously.⁶

LeDuc states that managers develop capabilities and emphases based upon eight different models in response to these expectations. One model that is relevant to this thesis is "manager of software".

This is the model favored by many 'techies,' but very few successful managers stay in this mode long. In fact, the trade literature is full of complaints that individuals who came up through the software building

⁶Albert L. LeDuc Jr., "It takes eight models to mold information systems managers" Data Management 24 (September 1986) : 34.

ranks lack the interest, training or temperament to be good managers.⁷

Another model is "manager of people".

The management of computer services personnel is a challenging activity. . . . Most successful managers are good people managers. Computer services managers are no exception; time spent on 'people problems' should be a normal part of this activity. Unfortunately, there is abundant evidence that computer services managers devote neither adequate time nor effort to this activity.⁸

This model is similar to Rand's characteristic "can deal with people."

Philip McGee, a professional trainer, also provides some insight into the characteristics of leaders.

I began to ask myself about the characteristics of leaders who made a real impact upon my life. How were they different from the many other superiors I had known?

The answer that came to me was that while they often did not possess great knowledge about 'management theory,' they were fair, sympathetic and honest. They had experience and expertise that related to a situation I was facing. Most of all, they seemed to care about me and what I was doing.

Beyond these personal qualities, they seemed to have a vision of what the organization was trying to accomplish.⁹

McGee also asked participants in his management-training classes to list the characteristics or qualities of people who had made a significant impact upon their lives.

I found the lists were very similar. "Natural leaders," people who made an impact upon the lives of others, shared common characteristics. These "charismatic"

⁷Ibid., p. 35.

⁸Ibid., p. 36.

⁹Philip H. McGee, "Management Training is not Enough" Training 21 (September 1984) : 122.

leaders were warm, open, friendly, wise and non judgmental. They gave good advice, but did not demand that it be taken. They were honest. They were optimistic. They listened well and seemed to have faith in themselves and others.¹⁰

Peter Drucker also points out the importance of people skills. "Executives spend more time on managing people and making people decisions than on anything else - and they should."¹¹

Becoming a Manager

John J. Gabarro conducted a study of the process of new managers taking charge¹². His research project consisted of fourteen management successions. The management positions used in the study were division president, general manager, and functional head. The unit revenues expressed in 1982 US dollars ranged from \$21 million through \$3 billion. Gabarro stated that the data suggest that the taking-charge process occurs in five predictable stages : taking hold, immersion, reshaping, consolidation, and refinement. The length of time the executives he studied spent in each stage varied. Some spent as long as eleven months and others as little as four in the same stage.

¹⁰Ibid.

¹¹Peter E. Drucker, "How to Make People Decisions" Harvard Business Review 4 (July-August 1985) : 22.

¹²Gabarro

He found that for thirteen of the fourteen new managers studied, their initial actions were in areas where they had functional experience, and the most significant changes they made during the three years also were in the areas where they had experience. Gabarro states that this pattern exists for general managers as well as functional managers, which reveals the extent to which experience influences action and point of view.

In his report Gabarro noted the success of the insiders (managers who have five or more years' experience in the new organization's industry) vs. the outsiders. Of the fourteen managers studied, seven were insiders and seven were outsiders. Whereas three of the four managers who did not succeed in their jobs lacked industry experience, only four of the ten successful managers lacked "inside" experience. One of three findings of Gabarro's study is that the all-purpose general manager who can parachute into any situation and succeed is a myth. Experience and special competencies do matter.

The Theory of Type

Explanation of the theory of type

Both the Keirsey Temperament Sorter and the Myers-Briggs Type Indicator are implementations of Jung's theory of type.¹³ Basically, the theory is that much apparently

¹³Jung

random variation in human behavior is actually quite orderly and consistent, being due to certain basic differences in the way people prefer to use perception and judgment.

According to the theory there are four pairs of preferences. These preferences are: Extraversion (E), Introversion (I), Sensing (S), Intuition (N), Thinking (T), Feeling (F), Judgment (J), and Perception (P). A brief summary of these preferences are shown in table 1.

TABLE 1
THE FOUR PREFERENCE PAIRS

Index	Preference as between	Affects individual's choice as to
EI	Extraversion or Introversion	Whether to direct perception and judgment upon environment or world of ideas
SN	Sensing or Intuition	Which of these two kinds of perception to rely on
TF	Thinking or Feeling	Which of these two kinds of judgment to rely on
JP	Judgment or Perception	Whether to use judging or perceptive attitude for dealing with environment

SOURCE: Isabel Briggs Myers, The Myers-Briggs Type Indicator (Palo Alto, CA: Consulting Psychologists Press, 1962), p. 1.

The EI index is designed to reflect whether the person is an extravert or an introvert. The extravert is oriented primarily to the outer world, and thus tends to focus his

perception and judgment upon people and things. The introvert is oriented primarily to the inner world postulated in Jungian theory, and thus tends to focus his perception and judgment upon concepts and ideas.

The SN index is designed to reflect the person's preference between two opposite ways of perceiving, i.e., whether he relies primarily on the familiar process of sensing, by which he is made aware of things directly through one or another of his five senses; or primarily on the less obvious process of intuition, which is understood as indirect perception by way of the unconscious, the emphasis being on ideas or associations that the unconscious tacks on to the outside things perceived.

The TF index is designed to reflect the person's preference between two opposite ways of judging, i.e., whether he relies primarily upon thinking, which discriminates impersonally between true and false, or primarily upon feeling, which discriminates between valued and not-valued.

The JP index is designed to reflect whether the person relies primarily upon a judging process (T or F) or upon a perceptive process (S or N) in his dealings with the outer world; that is, in the extraverted part of his life.

Keirsey and Bates have tabulated the differences within

pairs of preferences by words and phrases.¹⁴ These are shown in table 2 through table 5.

TABLE 2

CUE WORDS FOR EXTRAVERSION VS INTROVERSION

E (75% of population)	versus	I (25% of population)
Sociability.....		Territoriality
Interaction.....		Concentration
External.....		Internal
Breath.....		Depth
Extensive.....		Intensive
Multiplicity of relationships...		Limited relationships
Expenditure of energies.....		Conservation of energies
Interest in external events.....		Interest in internal reaction

SOURCE: David Keirsey and Marilyn Bates, Please Understand Me, 4th ed. (Del Mar, CA: Prometheus Nemesis Book Company, 1984), p. 25.

TABLE 3

CUE WORDS FOR SENSATION VS INTUITION

S (75% of population)	versus	N (25% of population)
Experience.....		Hunches
Past.....		Future
Realistic.....		Speculative
Perspiration.....		Inspiration
Actual.....		Possible
Down-to-earth.....		Head-in-clouds
Utility.....		Fantasy
Fact.....		Fiction
Practicality.....		Ingenuity
Sensible.....		Imaginative

SOURCE: David Keirsey and Marilyn Bates, Please Understand Me, 4th ed. (Del Mar, CA: Prometheus Nemesis Book Company, 1984), p. 25.

¹⁴Keirsey, p. 25.

TABLE 4

CUE WORDS FOR THINKING VS FEELING

T(50% of population)	versus	F(50% of population)
Objective.....		Subjective
Principles.....		Values
Policy.....		Social values
Laws.....		Extenuating circumstances
Criterion.....		Intimacy
Firmness.....		Persuasion
Impersonal.....		Personal
Justice.....		Humane
Categories.....		Harmony
Standards.....		Good or bad
Critique.....		Appreciate
Analysis.....		Sympathy
Allocation.....		Devotion

SOURCE: David Keirseay and Marilyn Bates, Please Understand Me, 4th ed. (Del Mar, CA: Prometheus Nemesis Book Company, 1984), p. 25.

TABLE 5

CUE WORDS FOR JUDGING VS PERCEIVING

J(50% of population)	versus	P(50% of population)
Settled.....		Pending
Decided.....		Gather more data
Fixed.....		Flexible
Plan ahead.....		Adapt as you go
Run one's life.....		Let life happen
Closure.....		Open options
Decision-making.....		Treasure hunting
Planned.....		Open ended
Completed.....		Emergent
Decisive.....		Tentative
Wrap it up.....		Something will turn up
Urgency.....		There's plenty of time
Deadline.....		What deadline?
Get show on the road.....		Let's wait and see

SOURCE: David Keirseay and Marilyn Bates, Please Understand Me, 4th ed. (Del Mar, CA: Prometheus Nemesis Book Company, 1984), p. 25-26.

Uses of the theory of type in the world of
software development

There are several studies in the literature that apply the theory of type to people in the data processing and software development professions. The findings stated in these studies are not consistent; but there are some important similarities.

Sitton and Chmelir make the statement: "In reality, the most common personality type for the data processor was ENTP (extroverted, intuitive, thinking, and perceiving)."¹⁵ Bush and Schkade found a different type to be predominant in their study. "The largest single cognitive style type among the subject population was ISTJ (introversion, sensing, thinking, judging). MBTI data collected over the years shows that 6% of the general population falls into this category as compared with almost 25% of the north Texas subjects."¹⁶

The fact that these two studies found very different types to be predominate should be viewed in context with their subject populations. Sitton and Chmelir describe there subjects as follows: "To get some idea of the personality type of data processors, we gave the test to 27 volunteers from four Texas computer installations: the State

¹⁵Sarah Sitton and Gerard Chmelir, "The Intuitive Programmer" Datamation 30 (October 15 1984) : 140.

¹⁶Chandler M. Bush and Lawrence L. Schkade, "In Search of the Perfect Programmer" Datamation 31 (March 15 1985) : 130.

Treasury, the College Coordinating Board, the Education Agency, and the Internal Revenue Service."¹⁷ Bush and Schkade appear to study a very different population. " . . . (40 programmer analysts from within computer organizations and 18 systems analysts from user organizations) at a north Texas high-technology aerospace firm . . . "¹⁸

Michael Lyons has conducted a much more extensive survey.

For the past three years, we've been conducting a survey of the personalities and work preferences of computer professionals employed by over 100 different companies. Although a large number of computer professionals have already participated in the survey, data are still being collected to study specific jobs and industries.

We are not trying to define or classify any typical personality. One might just as well try to describe a typical company.

At this time a total of 1,229 individuals have participated in the survey, 213 of whom work overseas in Australia and Great Britain. Almost all work for large to very large firms, including insurance companies, financial institutions, utilities, and hardware manufacturers.¹⁹

Lyons makes this statement about the predominance of types within his study: "These three personality types - ISTJ, INTJ, and INTP - account for just over 50% of the survey population."²⁰

¹⁷Sitton, p. 138.

¹⁸Bush, p. 128.

¹⁹Michael L. Lyons, "The DP Psyche" Datamation 31 (August 15 1985) : 103.

²⁰Ibid., p. 110.

Colonel Nidiffer has done extensive study of program managers in DOD using the Myers-Briggs Type Indicator. His interest lies in how program managers make decisions and how they deal with risk. He makes this statement about the 803 program managers he has studied: "The most significant deviation from the nominal was the ISTJ type. In general, the student data were seven times higher for this type than for the nominal data. In addition, based on the data collected, the ISTJ personality type was significantly predominant."²¹

Need for this Study

Rand's study compares the characteristics of good DP managers and good non-DP managers, but there is no mention in his report concerning the training or background of either group of managers. The subjects of Gabarro's study are high level executives. All of them had been effective managers before taking on their executive positions.

Nidiffer had this statement concerning the need for further study in his conclusions. "The literature is silent with respect to quantifiable data on what constitutes the optimum personality type for effective program managers. Third, the MBTI is gaining a lot of acceptance; however, follow-on effort is needed to fully validate the tool."²²

²¹Nidiffer, p. 14.

²²Ibid., p. 17.

CHAPTER III

PROCEDURE AND METHODOLOGY OF THE STUDY

Introduction

This chapter explains how the study was developed. It explains the development of the questionnaires used for data collection. It also explains how the questionnaire data was validated and analyzed.

General Method

The basic research design of this thesis is an analytical study. This thesis attempts to analyze the effectiveness of managers. It relates the managers' performance to their education level; type of degree; training; and their performance as technicians before they became managers. The data for this thesis was collected by the use of questionnaires.

Research Population

The population sample that was used to collect data for this thesis came from one department of one software company. The primary thrust of this company's business is military systems engineering and software engineering. The target population of the data collection is the first

(lowest) level managers and their subordinates. The title of first level managers in the subject organization is "section leader." Data were collected about and from these section leaders.

The general nature of the work that is performed by this sample population is the development of real-time process control computer systems. Customer interface is a fairly small portion of their work. The major portions of their work are program design, programming, and testing. Their work generally requires more interface with computers than with people.

Instrumentation

The data for this thesis were collected with the use of a questionnaire. The questionnaire was designed to collect data on the performance and personality characteristics of the managers. There are two questionnaires. The first questionnaire, reproduced in full in appendix A, is to be filled out by the managers. The second questionnaire, reproduced in full in appendix B, is to be filled out by the managers' employees. The first questionnaire collects data about the managers' perception of their own performance. It also collects data about their education and training. Data on the reasons why these managers were promoted were also collected. The second questionnaire collects data about the employees' perception of their managers' performance. Both the section leader

questionnaire and the section member questionnaire contain the questions from the Keirsey Temperament Sorter.

Data Collection

The data collection site was at a corporation whose primary business is military systems engineering. A questionnaire survey of the lowest level of managers (section leaders) in software development areas of the subject company was performed. A questionnaire survey of these managers' employees was also performed.

The questionnaires distributed to the managers are different from the questionnaires distributed to the employees. The primary purpose of the questionnaires distributed to the employees was to provide data on perceived performance of the managers in order to validate the same data collected from the managers. The primary purpose of the questionnaires distributed to the managers was to collect data to build a profile of their education, personality type and performance.

Advantages: The subjects of the data collection were available during the time frame of this thesis. It was possible get data on many managers. It was possible also to get a good indication of their educational background.

Disadvantages: The measure of the managers' performance was subjective; it was not possible to obtain an objective measurement of their performance with this questionnaire. Their performance could only be evaluated at

the time of the data collection. This thesis does not attempt to collect data on the managers' performance over an extended period of time. Additionally the subjects of the data collection all come from one company.

Pilot data collection

Students in an Advanced Technology Management class were used for the pilot data collection. There were fourteen fellow students in this class. All of these students were employees at the company where the actual data collection was to take place. Approximately one-fourth of the members of the pilot study group were in management positions. None of participants in the pilot data study were involved in the actual data collection.

Only the section leader questionnaire was distributed to the pilot study group. A description of the section member questionnaire was distributed for comments. Many of the questionnaires were returned with helpful comments. There were comments about the clarity of the instructions, about the wording of some of the questions, and about typographical and grammatical problems. These comments were incorporated into the final questionnaires.

The answers from the pilot questionnaires were entered into a Lotus^{®1} worksheet. This was helpful in the initial

¹Lotus[®] is a registered trademark of Lotus Development Corporation.

set-up of the Lotus® worksheet. The Lotus® macros were debugged using this pilot data.

Actual data collection

This thesis was faced with a dilemma. It is desirable to grant anonymity to the subjects, yet it was necessary to correlate the data from section members with the data from their corresponding section leaders. To resolve this dilemma, a control number was assigned to each questionnaire. The control number consisted of one letter and three digits. The letter identifies the section and one of the digits identifies the person. Letter identifiers, different from the letters on the questionnaires, appear with the data in the appendices. Once all of the questionnaires were collected they were piled into one big stack. The data from this big stack were entered into the Lotus^R worksheet. Once all of the data were entered, the letter identifiers that appear with the data in the appendices were assigned in the order in which the section leaders' data appeared in the Lotus^R worksheet.

The thesis author and one of the secretaries where the data was collected distributed the questionnaires to each person's desk on a Monday morning. The following machine copied, hand written note was attached to each questionnaire.

<person's name>
PLEASE REMOVE THIS COVER SHEET AND PUT THE COMPLETED
QUESTIONNAIRE IN THE BOX AT <SECRETARY'S NAME>'S DESK
BEFORE THURSDAY JUNE 11

The collection box was emptied at the end of each day during that first week. During the weekend, a new questionnaire was printed to be redistributed for each questionnaire that was not returned. These second questionnaires were distributed to the people's desks on Sunday. The collection box was emptied at the end of each day during the second week also. The data collection spanned a two-week period.

Study Design

There were three major portions to the design of this study: the elaboration of the hypothesis, the development of the content of the questionnaire, and the development of the questionnaire format.

Elaboration of the hypothesis

In order to answer the hypothesis presented in Chapter one, this thesis must elaborate propositions and define data that are relevant to providing answers to the propositions. Two major areas that need elaboration are: measuring the effectiveness of managers, and measuring managers' personality characteristics.

Measuring the effectiveness of managers

Measuring the effectiveness of managers has been the topic of other studies. Rand's study that was mentioned in Chapter two is one such study. Rand concluded that there are eleven characteristics that exemplify good DP managers. This thesis makes the assumption that these eleven characteristics can be used as indicators that a manager is an effective manager. This is an indirect method to determine whether a manager is effective. The thirteen questions that appear in section B and C of the section leader questionnaire are questions concerning these characteristics. Appendix A contains the section leader questionnaire. The thirteen questions that appear in section A and B of the section member questionnaire ask the same questions, but they are reworded to make the section leader the subject of the question. The section member questionnaire appears in appendix B.

Measuring managers' characteristics

The literature review has indicated that there are "tests" that can categorize people by "type." Two of these tests are The Keirsey Temperament Sorter and the Myers-Briggs Type Indicator. Both of these instruments are based on the Jung theory of type. This thesis uses the Keirsey Temperament Sorter in the questionnaires because it is a shorter test than the Myers-Briggs Type Indicator. The Keirsey Temperament Sorter consists of seventy dichotomous

questions. The MBTI consists of one hundred and sixty six questions. Most are dichotomous; nine are multiple choice. This thesis did not want to risk a low response rate because the questionnaire was overwhelming.

The literature provides support for the choice of using the theory of type.

The MBTI has been well researched and is widely accepted over the past 20 years. We have been using it with considerable success in our dp consulting and training courses for the past five years.²

Questionnaire content design

This thesis took a straightforward approach to developing questions concerning the eleven characteristics specified by Rand. The questionnaire contains thirteen questions that directly relate to Rand's eleven characteristics. For ten of the characteristics, there is one question each. For one characteristic, "enjoy leading," there are three questions: C17, C18, and C22. Questions C17 and C18 are opinion oriented and C22 is action oriented. Table 6 shows the correspondence between the eleven characteristics and the thirteen questions in the questionnaires. The first column, SL Num is the number of the question in the section leader questionnaire. The second column, SM Num is the number of the question in the section member questionnaire.

²Lyons, p. 103.

TABLE 6
ASSOCIATION OF QUESTIONS WITH CHARACTERISTICS

SL Num	SM Num	Characteristic
B10	A1	Clear Expectations
B11	A2	High Standards
B12	A3	Let Them Know
B13	A4	Democratic Approach
B14	A5	Team Spirit
B15	A6	Future Orientation
B16	A7	Flexibility
C17	B8	Enjoy Leading
C18	B9	Enjoy Leading
C19	B10	Empathy
C20	B11	Track Performance
C21	B12	Can Deal With People
C22	B13	Enjoy Leading

There are also questions that inquire about the managers' managerial and educational background. The thirteen questions about characteristics are in sections B and C of the section leader questionnaire. The background questions are in section A of the section leader questionnaire. The questions about the eleven characteristics are basically subjective.

Because these questions are subjective, this thesis makes a particular effort to ensure the accuracy of the answers. To do so, the thesis validates the managers' answers by collecting parallel data from their employees.

The questions for the Keirsey Temperament Sorter portion of the questionnaire are worded exactly as they appear in "Please Understand Me"³.

Questionnaire format design

This questionnaire was prepared by following authoritative guidelines. There is a wealth of literature devoted to the development, characteristics, presentation, and distribution of questionnaires.

This Questionnaire was formatted using the software text publishing system Interleaf[®].⁴ Interleaf is capable of combining text and graphics to produce a professional looking document. The copies of the questionnaires that appear in appendices A and B look almost identical to the questionnaires that were distributed to the subjects of this study. The original questionnaires have a one inch margin on all sides. The questionnaires have been photo reduced by eight percent to conform to the margins of this thesis.

³Keirsey, pp. 5-10.

⁴Interleaf[®] is a registered trademark of Interleaf, Inc.

By examining the questionnaires that appear in appendices A and B, one can see that the following rule has been adhered to in the development of this thesis.

The general rule is that the questionnaire should look as easy as possible to the respondent and should make the respondent feel that the questionnaire has been professionally designed.⁵

I chose to print the questionnaire using 12 point classic print. I reached this decision based on input from several sources.

The simple rule to follow here is that the type should be sufficiently large and clear as to cause no strain in rapid reading.⁶

I produced copies of the questionnaire using combinations of fourteen point, twelve point, and ten point as the font sizes; and classic, roman and helvitca as the font types. The different fonts are used to make it easy for the subjects to distinguish among instructions, questions and answers. I believe that the choice of twelve point classic produced a very easy to read questionnaire without producing a questionnaire that looked too large.

I endeavored to make as many questions as possible closed-ended questions. Closed-ended questions produce answers that are much easier to quantify than open-ended questions. The literature provided guidance on the layout of the answers.

⁵Seymour Sudman and Norman M. Bradburn, Asking Questions (San Francisco: Jossey-Bass, 1982), p. 243.

⁶Ibid., p. 244.

Balance all scales used in the response options. Include an equal number of options on each side of a middle position.⁷

Arrange response options vertically rather than horizontally. This helps reduce errors that occur when people mark the blank after the intended response rather than before it.⁸

Methods of Analysis

There are many types of data utilized here. There are seventy questions in the Keirseley Temperament Sorter. In the section leader questionnaire there are nine questions on education and background, seven questions on dealings with employees, and six questions about attitudes. This yields a total of ninety-two data items from each section leader. In the section member questionnaire there are seven questions on the section leader's dealings with them, and six questions about the section member's perception of the section leader's attitudes. This yields a total of eighty-three data items from each section member.

Multiple regression data analysis techniques are used for correlating the section leaders' attitudes and relational dealings to their background. Methods defined by

⁷Douglas R. Berdie, John F. Anderson, and Marsha A. Niebuhr, Questionnaires: Design and Use, 2nd ed. (Metuchen, NJ: Scarecrow Press, 1986), p. 39.

⁸Ibid., p. 39.

Keirsey⁹ and Myers¹⁰ are used for analysis of the Keirsey Temperament Sorter.

Encoding of Questionnaire Answers

Since the questionnaire data are being analyzed by statistical methods, the data must be encoded numerically. All of the questions that have an answer range of "very descriptive" to "very nondescriptive" are encoded from five to one. All of the characteristics questions are of this form. Table 7 shows the value that is assigned to each answer.

TABLE 7

NUMERICAL ASSIGNMENT OF ANSWERS FOR QUESTIONS
WITH FIVE CHOICES

Value	Answer
5	very descriptive
4	descriptive
3	uncertain
2	nondescriptive
1	very nondescriptive

In section A of the section leader questionnaire, there are four questions that cannot be encoded by this one-to-five method. Question A1 has three distinct, non-scalar choices. The three choices are consecutively assigned the

⁹Keirsey, pp. 11-13.

¹⁰Myers, pp. 7-10.

values of one, two, and three. These numbers are assigned as a convenient means of data entry and storage. No numerical analysis will be performed on the answers to question A1. Question A4 has six choices of answers. These choices are ranges of years. Table 8 shows the values assigned to the answers to question A4.

TABLE 8

NUMERICAL ASSIGNMENT OF ANSWERS FOR QUESTION A4

Value	Answer
0	no formal training
1	less than one year
2	less than two years
3	less than three years
4	less than four years
5	four years or more

Question A8 asks for educational degrees and dates that degrees were received. These data are not encoded. The answers to question A8 appear in table 20 in appendix C. Question A9 asks for the number of years spent as a manager/supervisor. These answers will be entered as they are; no encoding is needed.

Validation of Characteristics Data

Due to the subjective nature of the thirteen questions concerning managers' characteristics, extra effort must be taken to ensure the validity of the results. This thesis validates the characteristics data by performing an analysis

of the differences between the section leaders' answers and the corresponding section members' answers. An array of differences is generated by subtracting the value of an answer for each question for each section member from the value of the corresponding question for that section member's section leader. Since the section member's answer is subtracted from the section leader's answer, a positive difference indicates that the section leader rated himself higher than the section member rated him. A difference of zero indicates that the section leader and the section member rated the section leader the same. A negative difference indicates that the section leader rated himself lower than the section member rated him. A difference with an absolute value of four indicates that the section leader and the section member have exact opposite views on how well the section leader rates for that characteristic. For any particular question, if all of the differences were zero it would indicate that section leaders and their respective section members are in agreement on how the section leader rates on that question.

Ideally, for a good unbiased objective measurement of these characteristics or any characteristic, the differences should be normally distributed and not bimodal, and the range of values should be small. Figures 5 through 17 in appendix G show this graphically. To determine if the differences are normally distributed, this thesis uses the

chi-square test. The results of the chi-square test appear in table 9. Appendix F contains tables of values used in this chi-square analysis.

TABLE 9

RESULTS OF CHI-SQUARE TEST FOR NORMAL DISTRIBUTION
OF QUESTIONS B10 THROUGH C22

Question	Mean	Skewness	Sig.Level	Normal	Bimodal
B10	0.4762	0.6293	0.0989	YES	NO
B11	0.4921	0.7269	0.1133	YES	NO
B12	0.5396	-0.0295	0.0875	YES	NO
B13	0.6667	0.4171	0.0115	NO	NO
B14	0.8571	0.1687	0.5569	YES	NO
B15	0.5397	0.7051	0.0027	NO	NO
B16	0.4127	0.3783	0.6275	YES	NO
C17	0.6032	0.0323	0.3162	YES	NO
C18	0.2857	0.2536	0.1758	YES	NO
C19	0.4921	0.4999	0.3235	YES	NO
C20	0.3809	0.6555	0.1153	YES	NO
C21	0.0635	0.0499	0.4811	YES	NO
C22	0.6190	-0.3838	0.4013	YES	NO

The null hypothesis for this chi-square test is that the deltas are normally distributed. At a 5 percent significance level, only questions B13 and B15 are not normally distributed. An examination of the data for questions B13 and B15 show that their deviation from a normal distribution is that there are more zero deltas and fewer one deltas. This can be observed graphically in figures 8 and 10 in appendix G, and numerically in tables 32 and 34 in appendix F. By examining the other figures in appendix F it can be seen that this is a common pattern in

this data. Question B15 has the highest number of zero delta answers of all of the questions in this thesis. Since a zero delta indicates that a section leader and a section member gave the same answer, the results for question B13 and B15 should be considered valid.

Analysis of Keirsey Temperament Sorter

The analysis method described by Keirsey for the Keirsey Temperament Sorter is not appropriate for the numerical needs of this thesis. The structure of the Keirsey test allows the possibility for respondents to be in the middle of any of the four categories. This possibility arises because for each of the four preference pairs there is an even number of questions, and the answers are not weighted. There are twenty questions for each of the preference pairs, SN, TF, and JP and ten questions for the preference pair EI. Keirsey has a suggestion for resolving "mixed types." According to Keirsey, a respondent should mark an X for any pair if the score is 10 (5 for EI). He further says that the respondent should read the descriptions for the types that result from choosing either choice for that preference. The respondent could then decide which description provides a better description. Unfortunately, Keirsey's suggestion is not feasible for this study. Keirsey's method assumes the individual being evaluated is doing the analysis. This thesis must take a

different approach to scoring the Keirsey Temperament Sorter and in dealing with borderline preferences.

This thesis attempts to use an approach that gives the most accurate results. Many possibilities were considered in the search for a method that would give the most accurate results. Alternatives considered are discussed below.

Alternative 1) Delete all respondents with
borderline preferences

One possible approach is to delete all respondents with borderline preferences from the study. This approach would have a negative effect on the response rate. Since there were twenty-six respondents with borderline preferences, the response rate would drop from seventy-four percent to fifty percent. This solution would also have the negative aspect of deleting a subclass of respondents from the study, namely the subclass with borderline preferences.

Alternative 2) Treat all respondents with
borderline preferences as different types

At first glance this approach seems the best because it portrays the respondents as they actually responded. However, it has some serious drawbacks. For instance, if one preference were mixed, an additional thirty-two types would be added to the number of possible types, which would yield forty-eight types. Considering the possibility of having two preferences being mixed (there are four respondents with two borderline preferences) yields an

additional sixty-four types for a total of 112 types. There are eighty respondents in this study; it is not reasonable or useful to divide them into 112 categories. All studies in the literature, reviewed by this thesis, that use the Keirsey Temperament Sorter divide their sample populations into the standard sixteen types.

Alternative 3) Force a decision by deleting a question

If this thesis selects one question for each preference pair and deletes that question, there will no longer be any borderline preferences, if all respondents answer all questions. Deleting one question for each preference pair would leave an odd number of questions for each preference pair. One difficulty with this approach is in selecting the criteria for deleting a question. A possible criterion is to delete the question that the most respondents answer the same way. A serious detriment to this approach is that it actually constitutes a modification of the Keirsey Temperament Sorter instrument itself.

In the data collected for this thesis, there were some respondents who did not answer all of the questions. This would then give rise to the original problem of having an even number of questions answered for the two preferences of a preference pair.

Alternative 4) Make an arbitrary choice for each of the borderline preferences

Another possibility considered for this thesis would be arbitrarily to force each borderline preference to one side. This solution has the possibility of yielding sixteen different results depending on the choice of direction for the four different pairs. If the thesis chooses this solution it must justify using one of the 16 possibilities or analyze all of them. It is beyond the scope of this thesis to determine or justify which side to choose.

Alternative 5) Adopt the Myers-Briggs method of grading

The scoring method of the Myers-Briggs Type Indicator (MBTI) resolves the problems that this thesis has with the scoring method of the Keirsey Temperament Sorter. The MBTI has a tie-breaking mechanism built in. It also has a mechanism built in to deal with unanswered questions. In the MBTI the number of questions answered for each individual preference is added, yielding a set of eight numbers - two numbers for each preference pair.

Scoring a MBTI produces four preference scores, one for each of the four indices: EI, SN, TF, AND JP. Each index reflects one of the four preferences which, according to theory, determine type. The score for each index consists of a letter showing the direction of the preference the experimental subject reported, followed by a number showing its reported strength.

For each of the four indices, two keys are required. For example, the score for EI is obtained by determining the points for E and the points for I separately. Of the two values thus obtained, the greater number indicates the direction of the preference as well as the letter portion of the score. To complete the scoring, the smaller number is subtracted from the greater, and the preference score corresponding to that difference may be obtained from the appropriate column of the appropriate preference difference table. Table 10 is to be used for male preferences I, N, T, or P and for female preferences I, N, F, or P. Table 11 is to be used for male preferences E, S, F, or J and for female preferences E, S, T, or J.

TABLE 10

TRANSFORMATION OF DIFFERENCE BETWEEN POINT TOTALS
 INTO PREFERENCE SCORES FOR MALE: I, N, T, OR P
 AND FEMALE: I, N, F, OR P

Diff. in Points	Pref. Score	Diff. in Points	Pref. Score
0	= 1	16	= 33
1	= 3	17	= 35
2	= 5	18	= 37
3	= 7	19	= 39
4	= 9	20	= 41
5	= 11	21	= 43
6	= 13	22	= 45
7	= 15	23	= 47
8	= 17	24	= 49
9	= 19	25	= 51
10	= 21	26	= 53
11	= 23	27	= 55
12	= 25	28	= 57
13	= 27	29	= 59
14	= 29	30	= 61
15	= 31		

SOURCE: Isabel Briggs Myers, The Myers-Briggs Type Indicator (Palo Alto, CA: Consulting Psychologists Press, 1962), p. 8, table 1.

TABLE 11

TRANSFORMATION OF DIFFERENCE BETWEEN POINT TOTALS
 INTO PREFERENCE SCORES FOR MALE: E, S, F, OR J
 AND FEMALE: E, S, T, OR J

Diff. in Points	Pref. Score	Diff. in Points	Pref. Score
1	= 1	18	= 35
2	= 3	19	= 37
3	= 5	20	= 39
4	= 7	21	= 41
5	= 9	22	= 43
6	= 11	23	= 45
7	= 13	24	= 47
8	= 15	25	= 49
9	= 17	26	= 51
10	= 19	27	= 53
11	= 21	28	= 55
12	= 23	29	= 57
13	= 25	30	= 59
14	= 27	31	= 61
15	= 29	32	= 63
16	= 31	33	= 65
17	= 33	34	= 67

SOURCE: Isabel Briggs Myers, The Myers-Briggs Type Indicator (Palo Alto, CA: Consulting Psychologists Press, 1962), p. 8, table 1.

This thesis does not actually use these tables to look up the preference scores. The preference scores are actually automatically calculated in a Lotus^R worksheet. For statistical purposes, it is useful to convert the preference scores to continuous scores. "For an I, N, F or P score, the continuous score is the preference score plus 100. For an E, S, T or J score, the continuous score is 100 minus the preference score."¹¹

¹¹ibid., p. 9.

Self Selection Ratio

The Self-Selection Ratio (SSR)¹² is a measure of the self selection that is exercised by any type in a sample. The SSR is the percentage frequency of a type in the sample divided by its percentage frequency in the appropriate base population. An easy way to present the SSR is by the use of a "Type Table."¹³ The type table is divided into sixteen areas. Each area has four data items. These four data items are type, the number of people in the sample with that type, the percentage of that type, and the Self Selection Ratio. Values of SSR above 1.00 show positive self-selection. Values below 1.00 show some degree of avoidance. Where types with the highest SSR (often 1.20 or higher) are adjacent, they make a self selection area. Figures 1 through 3 are three different type tables based on the data for this thesis.

¹²Isabel Briggs Myers, Gifts Differing (Palo Alto, CA: Consulting Psychologists Press, 1980), pp. 40-41.

¹³Ibid., p. 27.

FIGURE 1

SELF SELECTION RATIO OF SECTION LEADERS USING
 THESIS SAMPLE POPULATION AS A BASE

ISTJ N=6 37.5% SSR=1.11	ISFJ N=0 0% SSR=0	INFJ N=1 6.3% SSR=1.25	INTJ N=1 6.3% SSR=1.66
ISTP N=0 0% SSR=0	ISFP N=0 0% SSR=0	INFP N=0 0% SSR=0	INTP N=0 0% SSR=0
ESTP N=0 0% SSR=0	ESFP N=0 0% SSR=0	ENFP N=0 0% SSR=0	ENTP N=1 6.3% SSR=1.66
ESTJ N=3 18.8% SSR=0.93	ESFJ N=1 6.3% SSR=2.5	ENFJ N=0 0% SSR=0	ENTJ N=3 18.8% SSR=3.75

FIGURE 2

SELF SELECTION RATIO OF THESIS SAMPLE POPULATION
 USING MYERS HIGH SCHOOL BOYS AS A BASE

ISTJ N=27 33.8% SSR=4.17	ISFJ N=3 3.8% SSR=0.94	INFJ N=4 5.0% SSR=2.36	INTJ N=3 3.8% SSR=0.80
ISTP N=0 0% SSR=0	ISFP N=1 1.3% SSR=0.28	INFP N=3 3.8% SSR=0.89	INTP N=1 1.3% SSR=0.20
ESTP N=1 1.3% SSR=0.16	ESFP N=1 1.3% SSR=0.19	ENFP N=4 5.0% SSR=0.70	ENTP N=3 3.8% SSR=0.47
ESTJ N=16 20.0% SSR=1.27	ESFJ N=2 2.5% SSR=0.38	ENFJ N=7 8.8% SSR=2.47	ENTJ N=4 5.0% SSR=0.75

FIGURE 3

SELF SELECTION RATIO OF SECTION LEADERS
USING SECTION MEMBERS AS A BASE

ISTJ N=6 37.5% SSR=1.14	ISFJ N=0 0% SSR=0	INFJ N=1 6.3% SSR=1.33	INTJ N=1 6.3% SSR=2
ISTP N=0 0% SSR=0	ISFP N=0 0% SSR=0	INFP N=0 0% SSR=0	INTP N=0 0% SSR=0
ESTP N=0 0% SSR=0	ESFP N=0 0% SSR=0	ENFP N=0 0% SSR=0	ENTP N=1 6.3% SSR=2
ESTJ N=3 18.8% SSR=0.92	ESFJ N=1 6.3% SSR=4	ENFJ N=0 0% SSR=0	ENTJ N=3 18.8% SSR=12

In Figure 3 there are five of the sixteen types that have a SSR of 1.20 or greater. These five types are ENTJ, ESFJ, ENTP, INTP AND INFP. Four of these five are adjacent; only ESFJ is not adjacent.

The percentages of the eight basic types also provide useful information. These data are shown in table 12. From these data, one can see that there are significantly more T's among the section leaders.

TABLE 12
 PERCENTAGES OF TYPES OF SECTION LEADERS AND SECTION MEMBERS

TYPE	MEMBERS	LEADERS	RATIO
E	46.9%	50.%	1.07
I	53.1%	50.%	.941
T	64.1%	87.5%	1.36
F	35.9%	12.5%	.34
S	64.1%	62.5%	.975
N	35.9%	37.5%	1.04
J	79.7%	93.8%	1.17
P	20.3%	6.3%	.307

Analysis of Background and Characteristics Data

This thesis uses section B and section C of the section leader questionnaire as a measure of the effectiveness of a section leader. These questions were developed from literature covered in chapter two.¹⁴ Questions in section A of the section leader questionnaire gather data about the experience and education of the section leaders.

¹⁴For a discussion of the development of these questions see pp. 29-31 above.

Calculation of SCORE and ADJUSTED SCORE

The variable SCORE is an important value used in the analysis of this thesis. SCORE provides a measure of the effectiveness of a manager. SCORE is the mean of B10, B11, B12, B13, B14, B15, B16, C17, C18ADJ, C19, C20, C21, and C22ADJ. Each of these thirteen answers have equal weight in the calculation of SCORE. Since, for both C18 and C22 a high value is "bad" and a low value is "good" C18 and C22 are adjusted before they are used in the calculation of SCORE. These adjusted values of C18 and C22 are called C18ADJ and C22ADJ respectively. C18ADJ is equal to 6 minus C18 and C22ADJ is equal to 6 minus C22.

SCORE has a serious shortcoming: it is based solely on the section leaders' evaluation of themselves. ADJUSTED SCORE does not suffer from this shortcoming. It is based on the inputs from the section members as well as the section leaders. To calculate ADJUSTED SCORE a new variable is needed. This new variable is MEMBER SCORE. MEMBER SCORE is the mean of A1, A2, A3, A4, A5, A6, A7, B8, B9ADJ, B10, B11, B12, B13ADJ for all of the members of each section. ADJUSTED SCORE is the mean of SCORE and MEMBER SCORE. ADJUSTED SCORE gives equal weight to the section leader input and the average of the section members input. Therefore ADJUSTED SCORE is based on fifty percent from the section leader and fifty percent from all of that section leaders' section members, whether there is one section

member or six section members. The final results of these calculations appear in table 13.

TABLE 13
VALUES OF SCORE AND ADJUSTED SCORE

SECTION LEADER	SCORE	ADJUSTED SCORE
A	4.4615	4.4327
B	4.4615	4.1923
C	4.2308	3.5769
D	3.9231	4.0128
E	3.8461	3.4679
F	4.2308	3.7308
G	4.6154	4.1154
H	4	4.0769
I	4	3.6667
J	4	3.9692
K	3.9231	3.9231
L	4.0769	3.6539
M	3.8461	3.8461
N	4.3846	4.0641
O	4.3077	3.8141
P	3.8462	3.3269

Data Handling Techniques

Due to the volume of data that this thesis is analyzing, it is imperative to have developed reliable and automated methods to handle and manipulate the data. Lotus[®], a spreadsheet program for IBM[®] PCs¹⁵ and IBM[®] compatible PCs, is used for data entry and electronic data storage.

¹⁵IBM[®] and PC[®] are registered trademarks of International Business Machines Corporation.

During the pilot study portion of this thesis, Lotus® macros were developed to aid in the rapid, error-free entry of the data. These macros include fetchers such as prompting with the name of the answer to be entered and error checking. One of the prompts is, "enter A1." These macros greatly eased the burden of data entry.

Lotus® and STATGRAPHICS®¹⁶ are used for the calculations performed with the data. All of the calculations for evaluating the Keirseý Temperament Sorter portion of the data were performed using Lotus®. STATGRAPHICS® was used for all of the calculations involved in the multiple linear regressions and hypothesis testing.

¹⁶STATGRAPHICS® is a registered trademark of Statistical Graphics Corporation.

CHAPTER IV

RESULTS

Response Rate

In the data collection phase of this study 108 questionnaires were distributed. Ninety-one were distributed to section members and seventeen were distributed to section leaders. Five section members were not available at the time of data collection, due to travel and assignment to other locations. Two questionnaires were returned uncompleted with this attached note: ". . . and I cannot fill these out because we have not worked for the bosses which these are correlated with." One questionnaire was returned incompletely filled out. One questionnaire was returned incompletely filled out and the control number was ripped off. Eighty questionnaires were returned completed, sixty-four from section members and sixteen from section leaders.

The overall response rate is seventy-four percent. The response rate for section leaders is ninety-four percent and the response rate for section members is seventy percent. Eliminating from the calculations the five section members that were not available due to travel and

assignments elsewhere yields an overall response rate of seventy-eight percent and a response rate for section members of seventy-four percent

Results of Analysis for Hypothesis 1

Hypothesis 1. The training and experience of software developers is sufficient to allow these persons to perform their jobs as managers effectively. Rival: The training and experience that contribute to the development of a good software developer is not sufficient for him or her effectively to perform the job of software development manager.

Relevant data for hypothesis 1

The questions from the section leader questionnaire that are relevant to answering hypothesis 1 are: A1, A2, A3, A4, A5, and B10 through C22. Question A1 is used to determine if the section leader's responses are valid to use in the analysis. Only section leaders checking the first box, a value of 3, can provide data that is valid to analyze hypothesis 1. The section leaders checking box 1 are the section leaders who were previously in technical software positions.

Questions A2 through A5 provide data about the section leaders' education and training. Questions B10 through C22 provide a measure of the section leaders' effectiveness in the form of SCORE and ADJUSTED SCORE. ADJUSTED SCORE also

contains all of the data from the section members' questionnaires that is relevant to hypothesis 1.

The values for the answers to the questions used in this analysis are listed in tables 13 and 20.

Analysis for hypothesis 1

Two sets of stepwise multiple regression are used in the analysis of the data for hypothesis 1. The first set uses SCORE as the dependent variable and the second set uses ADJUSTED SCORE as the dependent variable.

The first step of this analysis is to examine the values of A1. Only data from section leaders who have a value of 3 for question A1 are valid to use in the multiple regression for hypothesis 1. One can see from table 20 that all section leaders should be included in this analysis.

The first stepwise multiple regression uses SCORE as the dependent variable and A2, A3, A4, A5, A6 and A9 as the independent variables. This stepwise multiple regression was run using both the backward and forward method. By both methods, the F-values for all variables were too small to include the variable in the model.

The second stepwise multiple regression uses ADJUSTED SCORE as the dependent variable and A2, A3, A4, A5, A6, and A9 as the independent variables. When a forward stepwise multiple regression is run, all dependent variables have F values too small to be included in the model. In the backward stepwise multiple regression, variables A2, A4, A5

and A6 are eliminated, and A3 and A9 are retained in the model. Although A9 was included in the model, based on a F-value of four, it is not significant within a 95% confidence interval. This is indicated by the significance level value of 0.0553. This leaves only A3 as being a significant dependent variable for ADJUSTED SCORE. The resultant model is shown in table 14.

TABLE 14

HYPOTHESIS 1 MODEL FITTING RESULTS FOR ADJUSTED SCORE

Ind Variable	coefficient	std.error	t-value	sig. level
CONSTANT	4.585819	0.270084	16.9792	0.0000
A3	-0.188005	0.072736	-2.5848	0.0227
A9	-0.076664	0.036427	-2.1046	0.0553
R-SQ. ADJ. = 0.2676		SE = 0.246828		

Conclusions for hypothesis 1

Based on the values and the relationships of the data analyzed for this hypothesis, the hypothesis should be rejected and the rival accepted. That is to say, the training and experience as software developers is not sufficient background to allow these section leaders to perform their jobs effectively as managers.

From the stepwise multiple regression, we see that there is a statistically significant relationship only between A3 and the ADJUSTED SCORE. This relationship is a

negative one. The better section leaders indicate that their formal education was not adequate to handle their current management responsibilities. By examining the answers to question A8, which appear in table 20 of appendix C, we see that their formal education is generally in areas relevant to software development. By examining the means for questions A2, A3, A4, and A5 which appear in table 15 one can see that the values are low. All of the values are below three. Based on these values, it can be concluded that these section leaders feel that their training and education is inadequate to perform their management jobs.

TABLE 15
MEANS OF SECTION LEADERS' ANSWERS TO
QUESTIONS A2 THROUGH A5

Question	Mean
A2	2.75
A3	2.62
A4	0.69
A5	2.81

Results of Analysis for Hypothesis 2

Hypothesis 2. Software development companies promote people into management positions based on how well the people suit the needs of management positions. Rival: Software development companies use current technical

performance as a major criterion for promotion to a management position.

Relevant data for hypothesis 2

The questions from the section leader questionnaire that are relevant to answering hypothesis 2 are: A1, A6, and A7. Unlike the hypothesis 1 analysis, a value of 3 for A1 is not necessary for the section leader's data to be valid.

Analysis for hypothesis 2

A multiple regression is not necessary for the analysis of hypothesis 2. A matched pair hypothesis test is used. The paired data are A6 and A7. To reject hypothesis 2 and accept its rival, the true mean of the deltas of A7 minus A6 must be less than zero. Figure 4 is a summary of the calculations for this test.

FIGURE 4

HYPOTHESIS 2 SUMMARY DATA

95% Confidence Interval:	-1.55048 to -0.449524
Computed t-Statistic:	-3.87298
Significance Level:	7.50886E-4

Conclusions for hypothesis 2

Based on the calculation results shown in Figure 4 one can conclude that technical performance is a major criterion for promotion to a management position. This conclusion is

further strengthened by the fact that all of the questioned section leaders had been in software technical positions before they were in a software management position.

Results of Analysis for Hypothesis 3

Hypothesis 3. The personality characteristics exhibited by software developers are also exhibited by software development managers. Rival: The personality and characteristics of software developers and software development managers are quite different.

Relevant data for hypothesis 3

The questions from the section leader questionnaire that are relevant to answering hypothesis 3 are A1, B10 through C22, and the Keirsey Temperament Sorter. A1 is used to determine the validity of considering the section leaders as software developers. Questions B10 through C22 provide a measure of the section leaders' effectiveness, and are used in the form of SCORE and ADJUSTED SCORE. The use of B10 through C22 is identical to their use in the analysis of hypothesis 1.

Analysis for hypothesis 3

There are two distinct methods used in the analysis for hypothesis 3. First, the stepwise multiple regression

method used for hypothesis 1 is used. Second, the Self Selection Ratio¹ technique of Myers is used.

Two sets of stepwise multiple regression are used in this analysis. The first set uses SCORE as the dependent variable; the second set uses ADJUSTED SCORE as the dependent variable.

The first stepwise multiple regression uses SCORE as the dependent variable and EIcont, SNcont, TFcont, and JPcont as the independent variables. EIcont, SNcont, TFcont, and JPcont are the continuous scores from the Keirsey Temperament Sorter using the Myers method of analysis. This stepwise multiple regression was run using both the backward and forward method. By both methods, the F values for all variables were too small to include the variable in the model.

The second stepwise multiple regression uses ADJUSTED SCORE as the dependent variable, and EIcont, SNcont, TFcont, and JPcont as the independent variables. Both the forward and backward methods yielded the same model. The F values for EIcont, SNcont, and JPcont were too small for these variables to be included in the model. Only TFcont was included in the model. The resultant model is shown in table 16.

¹For an explanation of Self Selection Ratio see pp. 45-47 above.

TABLE 16

HYPOTHESIS 3 MODEL FITTING RESULTS FOR ADJUSTED SCORE

Ind Variable	coefficient	std.error	t-value	sig. level
CONSTANT	2.640663	0.444546	5.9401	0.0000
TFcont	0.01372	0.004929	2.7837	0.0146
R-SQ. ADJ. = 0.3103		SE = 0.23952		

The coefficient for TFcont is positive, indicating that a higher ADJUSTED SCORE is associated with a higher TFcont value. Higher values of TFcont indicate a more "feeling" way of making decisions.

Conclusions for hypothesis 3

The null hypothesis that the personality characteristics of software developers and software managers are the same should be rejected. The rival hypothesis that the characteristics are different should be accepted. This conclusion is based on measuring personality characteristics via the Keirsey Temperament Sorter. Based on the results of the analysis of hypothesis 2, one can conclude that the managers in this study are good software developers. The Self Selection Ratio and the percentages of the different types show the T types to be good software developers. The Self Selection Ratio of section leaders to section members

appear in Figure 3. The results of the multiple regression show that the better managers lean more strongly to the F direction on the TF scale.

Other Results of Data Analysis Relevant to All
Three Hypotheses

In the analysis for hypothesis 1 and hypothesis 3 only some of the available data were used in constructing a model for ADJUSTED SCORE. It is worthwhile to attempt to construct a model for ADJUSTED SCORE using all of the available data. A series of stepwise multiple linear regressions were run to construct this model. During the analysis it became obvious that there were two models of interest. The first model includes only independent variables that are significant at a ninety-five percent level. This model is shown in table 17.

The second model contains all of the independent variables that yield the highest possible R-Squared Adjusted value. The higher the value of R-Squared the more accurate the model is in predicting the value of the dependent variable. This model appears in table 18. A9 and EIcont are not significant at a ninety-five percent level but they improve the accuracy of the model.

TABLE 17

MODEL FITTING RESULTS FOR ADJUSTED SCORE WITH
ALL POSSIBLE DEPENDENT VARIABLES CONSIDERED

Ind Variable	coefficient	std.error	t-value	sig. level
CONSTANT	2.845514	0.374763	7.5928	0.0000
A3	-0.138389	0.050482	-2.7413	0.0168
TFcont	0.015492	0.004123	3.7580	0.0024
R-SQ. ADJ. = 0.5293		SE = 0.197866		

The dependent variable that has the most significance in the model is A3. Question A3 is: "My formal education helped prepare me to handle my current management/ supervisory responsibilities". The sign of the coefficient is negative. A negative coefficient indicates that lower values of A3 are associated with higher values of ADJUSTED SCORE. This is an indication that the more effective managers are more aware that their formal education has not prepared them for their management responsibilities.

TABLE 18

MODEL FITTING RESULTS FOR ADJUSTED SCORE WITH
ALL POSSIBLE DEPENDENT VARIABLES CONSIDERED
YIELDING THE HIGHEST R-SQUARED

Ind Variable	coefficient	std.error	t-value	sig. level
CONSTANT	4.431045	0.716916	6.1807	0.0001
A3	-0.192505	0.052194	-3.6883	0.0036
A9	-0.046488	0.029202	-1.5920	0.1397
EIcont	-0.009222	0.004206	-2.1928	0.0507
TFcont	0.011292	0.004141	2.7268	0.0197
R-SQ. ADJ. = 0.6437		SE = 0.172156		

Of the four preference pairs: EIcont, SNcont, TFcont, and JPcont, two of them appear in the model. EIcont has a negative coefficient and TFcont has a positive coefficient. This indicates that the more effective section leaders are more "extroverted" and more "feeling."

Data on the personality types of eighty software developers were collected for this thesis. The literature review shows that the same data has been collected about other software professionals. Nidiffer studied 803 program managers.² Lyons collected data from a wide variety of software professionals; he presented data on 1,229 computer professionals.³ The percentages of these types appear in

²Nidiffer, pp. 14-17.

³Lyons, pp. 105-8.

table 19. Table 19 also contains a column labeled "nominal." This nominal data is based on 3,503 high-school students.⁴

The one type that is significantly and consistently higher than in the nominal group in all three computer groups is ISTJ. Both Nidiffer and Lyons found this noteworthy.

The most significant deviation from the nominal was the ISTJ type. In general, the student data were seven times higher for this type than for the nominal data. In addition, based on the data collected, the ISTJ personality type was significantly predominant.⁵

The personality type with the highest occurrence, almost 23%, is ISTJ - the combination of introversion, sensing, thinking, and judging. ISTJs assume responsibility readily and tend to be very dependable and persevering. They usually maintain a conservative outlook and avoid taking any unnecessary risks.

An ISTJ is likely to feel very much at home in a large conservative organization with well-defined policies and procedures. They will gravitate toward secure positions and try to avoid areas like sales, user liaison, and training.⁶

⁴Myers, Gifts Differing p. 31.

⁵Nidiffer, p. 14.

⁶Lyons, p. 108.

TABLE 19
COMPARISON OF TYPES

Type	Nominal ^a	Thesis	Nidiffer ^b	Lyons ^c
E	61.5%	47.5%	37.6%	32.9%
I	38.5%	52.5%	62.4%	67.1%
S	57.9%	63.7%	61.5%	46.3%
N	42.1%	36.3%	38.5%	53.7%
T	61.8%	68.7%	84.9%	80.9%
F	38.2%	31.3%	15.1%	19.1%
J	51.2%	82.5%	72.4%	65.7%
P	48.8%	17.5%	27.6%	34.3%
ST	36.6%	55.0%	53.6%	39.2%
SF	21.3%	8.7%	7.9%	7.1%
NF	16.9%	22.5%	7.1%	12.0%
NT	25.2%	13.7%	31.4%	41.7%
ISTJ	8.1%	33.7%	30.1%	22.6%
ISFJ	4.0%	3.7%	3.5%	3.9%
INFJ	2.1%	5.0%	1.7%	2.7%
INTJ	4.7%	3.7%	10.2%	15.5%
ISTP	5.1%	0.0%	5.4%	5.2%
ISFP	4.4%	1.3%	1.1%	1.5%
INFP	4.2%	3.7%	2.5%	3.6%
INTP	6.0%	1.3%	7.8%	12.1%
ESTP	7.7%	1.3%	3.6%	2.1%
ESFP	6.4%	1.3%	.6%	.7%
ENFP	7.1%	5.0%	1.9%	3.4%
ENTP	7.9%	3.7%	4.7%	5.6%
ESTJ	15.7%	20.0%	14.4%	9.3%
ESFJ	6.55	2.5%	2.7%	1.0%
ENFJ	3.55	8.7%	1.0%	2.4%
ENTJ	6.6%	5.0%	8.6%	8.4%

SOURCE: ^aIsabel Briggs Myers, Gifts Differing (Palo Alto, CA: Consulting Psychologists Press, 1980), pp. 31 Figure 3.

^bColonel Kenneth E. Nidiffer, USAF, "The Personality Factor: Software Technology and the 'Thinking Styles' of Program Managers" Program Manager, July-August 1984.

^cMichael L. Lyons, "The DP Psyche" Datamation 31 (August 15 1985) : 103-5.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

Conclusions

This thesis has stated the following objective: "The objective of this thesis is to show that current practices of promotion and training are not conducive to the development of good managers."¹ This thesis developed three hypotheses, that should be rejected and their rivals accepted, in order to reach the stated objective. Based on the collected data, this thesis has indeed shown that all three hypotheses should be rejected and their rivals accepted.

This thesis has shown that good software developers are being promoted into management positions; and that the training they receive is not adequate to allow them to perform their management jobs effectively. The data indicate that technical performance, without much regard for management skills, is used as a major criterion for promotion into a management position, and that good technical performance is not a good indicator of good managerial performance.

¹see p. 1, above.

ImplicationsImplications for software developers with a
desire for managerial advancement

Software developers are faced with a serious dilemma. The data indicate that they are more likely to receive a promotion into management based on their technical skills rather than on their managerial abilities. The problem they face is that it is more advantageous to concentrate on developing their technical skills and ignore their managerial skills. Once they are promoted, they will tend to depend on the technical skills they have been developing, rather than tending to use the more effective managerial skills that they have not developed. Gabarro has noted this same phenomenon among high-level managers taking charge. "All other things being equal, managers' special competencies appear to determine how they take charge. . . . their initial actions were in areas where they had had functional experience, and the most significant changes they made during the three years also were in the areas where they had experience."² One of the skills that is lacking is "communication." This is obvious from the comments from the questionnaires of the section members that appear in appendix C.

²Gabarro, p. 116.

Implications for higher level managers

The data indicate that higher level managers are placing too much emphasis on technical merit and not enough emphasis on managerial merit as a criterion for promotion. If higher level managers were to place more emphasis on managerial merit and less on technical merit, they could help lessen the perspective manager's dilemma.

High level management should also provide managerial training for new managers. This training should be such that the new managers become aware of what their responsibilities are, and what skills are necessary to carry out their new responsibilities effectively.

Need for Further Study

This thesis has shown that there are correlations between personality type and being a good software developer. This thesis has also shown that there are correlations between personality type and being a manager. Based on the data collected for this thesis, one cannot conclude whether the differences indicated by the SSR analysis of the Keirsey Temperament Sorter are more of an indication that these managers are good managers or that they were good software developers. There are certain factors that this thesis did not deal with that must be dealt with to attempt to answer these questions. Some historical data are necessary to answer these questions. A longitudinal study, possibility three to five years, should

be conducted to answer such questions as the following.

Which personality types have the highest and lowest turnover rates in the work-force? Which personality types of section leaders tend to get promoted to the next level of supervision? Which personality types of section leaders are demoted back into the work-force? These questions point in the direction of areas for further research in this field.

APPENDIX A

SECTION LEADER QUESTIONNAIRE

MASTERS THESIS STUDY

**THE CHARACTERISTICS
AND TRAINING OF
SOFTWARE MANAGERS**

**BY
GARY NAZELROD**

This questionnaire is divided into two parts. Part I asks questions about managers and their jobs. Part II is the Keirsey Temperament Sorter it contains general questions.

Part I

This part of the questionnaire should only take about 25 minutes of your time. It is divided into three sections. Section A contains questions about your education and background. Section B contains questions about your dealings with your employees. Section C contains questions about your attitudes. Please answer all questions as accurately as possible. An area for comments appears at the end of Part I. Please feel free to provide comments and examples to elaborate any answers. A similar questionnaire is being given to your section members. It asks the same questions that are in sections B and C. They are reworded to get your section members responses about you. I am soliciting data from your section members also as a means of validating the data for my thesis. A control number appears on each questionnaire as a means of correlating data from section members with that of their section leader. There is no need to sign this questionnaire. These finished questionnaires will not be seen by your superiors or by your section members.

Section A

1. Before I was in a software management/supervisory position I was in

- a software technical position
- nonsoftware management position
- other

2. I feel that the management training I have received, i.e. formal training, seminars, informal training, and on the job training have prepared me to perform my management/supervisory functions

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

3. My formal education helped prepare me to handle my current management/supervisory responsibilities

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

4. How much formal management/supervisory training have you received:

- no formal training
 less than one year
 less than two years
 less than three years
 less than four years
 four years or more

5. My formal management/supervisory training has been adequate for me to perform my management/supervisory functions

- very descriptive
 descriptive
 uncertain
 nondescriptive
 very nondescriptive

6. I was promoted into a supervisory position because I did well in my previous position as a technical member of the staff

- very descriptive
 descriptive
 uncertain
 nondescriptive
 very nondescriptive

7. I was promoted into a supervisory position because I demonstrated (when given the chance) that I could perform supervisory functions

- very descriptive
 descriptive
 uncertain
 nondescriptive
 very nondescriptive

8. List the degrees (including discipline and date) that you have received:_____

9. How many years have you been a manager/supervisor?_____

Section B

10. When any of my employees turn in work to me that is not as good as I expect it to be, I discuss the shortcoming with them and work with them to improve it

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

11. When I assign a task to an employee, I express myself clearly to my employees about what I expect turned in and when I expect it

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

12. I let my employees know whether their work is good or bad

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

13. I solicit ideas and opinions from my employees and use these ideas and opinions in decision making

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

control #

14. I try to instill in my employees the feeling that they are important members of a team

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

15. I try to foresee problems and prepare for them

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

16. I am flexible in my approach to problems rather than continually using the same approach

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

Section C

17. I enjoy seeing my employees accomplish tasks that are assigned to my section

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

18. It makes me happy when I personally perform tasks that are assigned to my section

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

19. I care about my employees feelings

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

20. I know what tasks each of my employees is working on and when each task due

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

21. I find it easy to deal with employees on non-technical issues

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

22. I will often do a task rather than take the time to delegate the task to an employee control #

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

Comments:

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These consist of pages: 78-84, KEIRSEY TEMPERAMENT SORTER

U·M·I

APPENDIX B

SECTION MEMBER QUESTIONNAIRE

MASTERS THESIS STUDY

**THE CHARACTERISTICS
AND TRAINING OF
SOFTWARE MANAGERS**

**BY
GARY NAZELROD**

This questionnaire is divided into two parts. Part I asks questions about managers and their jobs. Part II is the Keirsey Temperament Sorter it contains general questions.

Part I

This part of the questionnaire should only take about 20 minutes of your time. It contains questions concerning your section leader. It is divided into two sections. Section A contains questions about your section leader's dealings with you. Section B contains questions about your perceptions of your section leader's attitudes. Please answer all questions as accurately as possible, check the box that seems most appropriate. An area for comments appears at the end of part I. Please feel free to provide comments and examples to elaborate any answers. Your section leader is being asked the same questions about himself. I am soliciting data from both section leaders and section members as a means of validating the data for my thesis. A control number appears on each questionnaire as a means of correlating data from section members with that of their section leader. There is no need to sign this questionnaire. These finished questionnaires will not be seen by your superiors.

Section A

1. When I turn in work to my section leader that is not as good as he expects it to be, he discusses the shortcomings with me and works with me to improve it

- very descriptive
 descriptive
 uncertain
 nondescriptive
 very nondescriptive

2. When my section leader assigns a task, he expresses himself clearly to me about what he expects turned in and when he expects it

- very descriptive
 descriptive
 uncertain
 nondescriptive
 very nondescriptive

3. My section leader lets me know whether my work is good or bad

- very descriptive
 descriptive
 uncertain
 nondescriptive
 very nondescriptive

control #
4. My section leader solicits ideas and opinions from me and uses these ideas and opinions in decision making

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

5. My section leader tries to instill in me the feeling that I am an important member of a team

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

6. My section leader tries to foresee problems and prepare for them

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

7. My section leader is flexible in his approach to problems rather than continually using the same approach

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

Section B

8. My section leader enjoys seeing me accomplish tasks that are assigned to our section

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

9. It makes my section leader happy when he personally performs tasks that are assigned to our section

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

10. My section leader cares about my feelings

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

11. My section leader knows what tasks I am working on and when each task is due

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

12. My section leader finds it easy to deal with me on non-technical issues

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

13. My section leader will often do a task rather than take the time to delegate the task to me

- very descriptive
- descriptive
- uncertain
- nondescriptive
- very nondescriptive

Comments:

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These consist of pages: 91-97, KIERSEY TEMPERAMENT SORTER

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APPENDIX C

QUESTIONNAIRE DATA

TABLE 20

DATA FROM SECTION A OF SECTION LEADER QUESTIONNAIRES

Section Leader	A1	A2	A3	A4	A5	A6	A7	A8	A9
A	3	4	2	1	3	5	4	BA Math 80, BS Comp Sci 80	4
B	3	3	3	0	4	5	4	BS EE 83, BS CS 83	2
C	3	3	4	0	1	5	5	BS EE 80	0.75
D	3	3	2	1	3	4	4	BA BIOL Sc 78, BS CS 84	1
E	3	4	4	1	3	5	3	BA PHYS 72, MS CS 77	4
F	3	4	1	1	4	5	2	NONE	8
G	3	2	2	0	2	5	4	BA Math 80	2.5
H	3	2	2	1	3	5	2	BA Philosophy 64	4
I	3	2	2	1	2	5	4	BS CS 80	3.5
J	3	2	4	1	2	5	3	BS Math 83	0.3
K	3	2	3	0	3	4	4	BA PHYS 76, BA MATH 76	2
L	3	3	3	0	4	4	4	BS MATH 79, MS CS 87	1
M	3	2	2	0	2	4	4	BA ENGL 72, BS EE 83	2
N	3	2	1	1	2	5	4	BS CS 80	4
O	3	3	4	2	4	5	5	NONE	2
P	3	3	3	1	3	5	4	BS EE 59, MS EE 63	6

TABLE 21

DATA FROM SECTION B OF SECTION LEADER QUESTIONNAIRES

Section Leader	B10	B11	B12	B13	B14	B15	B16
A	4	5	4	5	4	5	5
B	5	5	5	5	5	5	4
C	5	4	4	4	5	4	5
D	4	4	5	5	4	5	4
E	4	3	4	3	5	4	4
F	4	5	4	3	4	4	4
G	5	5	5	4	5	5	5
H	5	4	4	4	4	4	4
I	4	4	4	4	4	4	4
J	5	4	4	4	5	4	4
K	5	4	4	4	4	5	4
L	5	4	2	5	4	4	3
M	4	4	4	4	4	4	3
N	4	5	5	5	5	5	4
O	4	4	4	5	5	4	5
P	4	4	4	4	4	4	4

TABLE 22

DATA FROM SECTION C OF SECTION LEADER QUESTIONNAIRES

Section Leader	C17	C18	C19	C20	C21	C22
A	5	4	5	5	5	2
B	5	5	5	5	4	2
C	5	4	5	4	4	2
D	5	4	4	4	4	5
E	5	2	4	3	3	2
F	4	1	3	5	5	1
G	5	3	5	4	4	1
H	5	4	4	4	5	3
I	5	2	4	4	3	2
J	4	4	4	5	3	2
K	4	3	4	4	3	3
L	4	2	5	4	4	1
M	5	4	4	4	4	2
N	5	4	4	5	4	2
O	5	4	5	4	5	2
P	4	3	4	4	3	2

TABLE 23

TYPE DATA FROM SECTION LEADER QUESTIONNAIRES

Section Leader	COUNT											Continuous Score				TYPE
	E	I	S	N	T	F	J	P	EI	SN	TF	JP				
A	6	4	14	6	7	13	15	5	97	85	111	81	ESFJ			
B	5	5	7	13	7	13	15	5	101	113	111	81	INFJ			
C	6	4	18	2	16	4	16	3	97	69	75	75	ESTJ			
D	1	9	15	5	13	7	14	6	117	81	87	85	ISTJ			
E	7	3	6	14	14	6	11	9	93	117	83	97	ENTJ			
F	5	5	19	1	18	2	18	2	101	65	67	69	ISTJ			
G	8	2	8	12	11	9	16	4	89	109	95	77	ENTJ			
H	9	1	8	12	13	7	10	10	85	109	87	101	ENTP			
I	3	7	9	11	12	8	17	3	109	105	91	73	INTJ			
J	7	3	11	9	11	9	20	0	93	97	95	61	ESTJ			
K	2	8	14	6	14	5	16	4	113	85	81	77	ESTJ			
L	1	9	12	8	10	10	17	3	117	93	99	73	ISTJ			
M	4	6	16	4	11	9	17	3	105	77	95	73	ISTJ			
N	6	4	16	4	15	5	18	2	97	77	79	69	ESTJ			
O	9	1	7	13	10	10	13	7	85	113	99	89	ENTJ			
P	1	9	15	5	16	4	15	5	117	81	75	81	ISTJ			

TABLE 24

DATA FROM SECTION A OF SECTION MEMBER QUESTIONNAIRES

Section Member	A1 (B10)	A2 (B11)	A3 (B13)	A4 (B13)	A5 (B14)	A6 (B15)	A7 (B16)
A1	4	5	5	5	5	5	5
A2	4	4	4	4	4	4	4
A5	5	4	5	4	5	4	4
A6	5	5	4	4	3	5	5
B2	4	4	4	3	3	4	4
B4	4	4	4	3	4	3	3
B5	5	4	4	5	4	3	4
C1	3	4	4	2	2	1	2
D1	4	4	4	3	3	4	3
D2	5	4	2	4	5	4	4
D3	4	4	4	3	3	3	3
E1	3	3	4	4	3	4	4
E2	4	2	3	4	5	2	3
E3	3	2	2	2	3	4	2
E4	2	2	2	2	4	4	1
E5	5	4	4	3	4	4	5
E6	4	4	4	4	4	4	4
F1	5	4	5	5	5	5	5
F2	4	5	4	3	4	2	5
F3	4	4	4	1	1	4	2
G1	4	5	4	4	5	5	4
G2	5	4	4	4	4	4	4
G3	4	4	4	4	2	3	3
G4	4	4	4	4	4	6	3
G5	5	5	4	4	5	5	4
G6	4	4	4	3	3	4	4
H4	5	4	5	4	5	4	4
H5	3	4	3	4	4	3	3
H6	4	4	4	4	4	4	4
I1	4	4	3	5	5	4	3
I2	4	4	4	4	4	4	4
I3	4	4	3	2	2	4	4

TABLE 24 - CONTINUED

Section Member	A1 (B10)	A2 (B11)	A3 (B13)	A4 (B13)	A5 (B14)	A6 (B15)	A7 (B16)
I4	3	3	3	3	3	4	3
I5	5	5	5	5	5	5	5
I7	3	2	4	1	1	4	3
J1	5	4	4	3	5	4	4
J3	5	2	3	4	4	4	3
J6	5	5	4	4	4	4	5
J7	4	4	3	3	3	4	4
J8	4	4	4	3	4	5	5
K1	5	4	4	4	5	5	4
L1	4	5	5	5	5	4	4
L2	4	4	3	2	2	4	4
M3	4	5	5	4	5	4	4
M4	4	3	4	4	3	5	4
M5	4	5	2	4	2	4	5
M6	5	4	4	4	4	4	4
N2	3	3	4	5	5	3	4
N3	4	5	4	5	4	5	5
N4	3	5	4	4	4	4	4
N5	3	4	4	5	5	4	4
N7	2	2	2	3	1	4	3
N8	4	4	4	4	3	4	4
O1	4	4	4	5	5	3	5
O2	2	3	4	3	4	2	4
O3	1	1	1	2	3	2	3
O4	4	4	5	4	4	4	5
O5	4	3	4	4	3	3	4
O6	2	1	4	4	4	4	2
P1	4	4	3	4	3	4	4
P2	3	4	3	4	3	4	4
P5	1	2	1	1	2	1	3
P6	4	3	2	1	2	3	2
Q1	4	4	4	5	3	4	3

TABLE 25

DATA FROM SECTION B OF SECTION MEMBER QUESTIONNAIRES

Section Member	B8 (C17)	B9 (C18)	B10 (C19)	B11 (C20)	B12 (C21)	B13 (C22)
A1	5	5	4	5	5	5
A2	5	3	4	5	5	3
A5	5	4	4	5	3	3
A6	5	5	5	5	5	2
B2	4	3	3	4	3	3
B4	4	5	3	5	4	5
B5	5	3	4	5	3	1
C1	4	4	4	5	2	1
D1	3	4	4	4	3	3
D2	5	5	5	5	2	2
D3	4	3	3	4	3	3
E1	3	3	4	2	2	3
E2	4	3	3	2	5	2
E3	4	4	4	2	3	4
E4	4	4	3	1	2	2
E5	5	3	4	5	4	4
E6	5	5	5	4	4	4
F1	5	5	5	5	5	3
F2	5	3	4	2	5	3
F3	3	5	1	4	4	2
G1	5	4	5	5	5	2
G2	4	4	4	4	4	3
G3	4	5	4	4	5	2
G4	4	3	4	5	5	2
G5	4	3	4	5	3	3
G6	4	2	3	4	3	1
H4	5	4	5	5	5	4
H5	3	5	3	3	3	5
H6	4	4	4	4	4	3
I1	4	5	3	4	5	1
I2	4	4	4	4	3	4
I3	4	4	4	3	3	3

TABLE 25 - CONTINUED

Section Member	B8 (C17)	B9 (C18)	B10 (C19)	B11 (C20)	B12 (C21)	B13 (C22)
I4	4	4	4	4	4	3
I5	5	5	5	5	4	1
I7	3	3	1	5	1	3
J1	5	4	4	4	3	3
J3	4	4	4	3	3	3
J6	5	3	5	5	5	4
J7	5	4	4	4	3	2
J8	5	3	5	5	5	1
K1	4	3	3	4	4	2
L1	5	2	5	5	5	1
L2	2	4	3	3	4	2
M3	5	2	4	4	4	2
M4	4	3	5	4	4	4
M5	4	3	3	5	4	2
M6	4	3	4	4	4	2
N2	4	2	4	2	4	2
N3	5	4	5	5	5	2
N4	5	2	5	3	5	5
N5	5	3	5	4	5	1
N7	4	3	3	2	4	3
N8	3	4	3	3	4	4
O1	4	4	4	3	5	2
O2	3	4	4	3	4	1
O3	4	1	1	1	4	1
O4	5	4	5	4	5	4
O5	4	4	4	3	4	4
O6	4	1	4	1	4	1
P1	4	3	4	5	4	3
P2	4	4	4	5	4	2
P5	1	3	1	4	1	3
P6	3	3	2	2	3	3
Q1	3	3	4	3	4	2

TABLE 26
TYPE DATA FROM SECTION MEMBER QUESTIONNAIRES

Section Member	COUNT													Continious Score					TYPE
	E	I	S	N	T	F	J	P	EI	SN	TF	JP							
A1	7	3	9	11	8	12	13	7	93	105	107	89			ENFJ				
A2	8	2	11	9	12	8	17	3	89	97	91	73			ESTJ				
A5	8	2	14	5	13	7	16	4	89	83	87	77			ESTJ				
A6	7	3	3	17	8	12	10	10	93	129	107	101			ENFP				
B2	5	5	13	7	14	6	18	2	101	89	83	69			ISTJ				
B4	5	5	16	4	11	9	15	5	101	77	95	81			ISTJ				
B5	3	7	13	7	15	5	12	8	109	89	79	93			ISTJ				
C1	4	6	7	13	5	15	10	10	105	113	119	101			INFP				
D1	1	9	13	7	7	13	14	6	117	89	111	85			ISFJ				
D2	4	5	11	8	15	5	19	1	103	95	79	65			ISTJ				
D3	4	6	7	13	12	8	8	12	105	113	91	109			INTP				
E1	4	6	9	11	8	12	9	11	105	105	107	105			INFP				
E2	6	4	11	7	15	5	15	5	97	93	79	81			ESTJ				
E3	3	7	14	6	16	4	19	1	109	85	75	65			ISTJ				
E4	4	6	11	9	14	6	18	2	105	97	83	69			ISTJ				
E5	5	5	15	5	16	4	15	5	101	81	75	81			ISTJ				
E6	8	2	14	5	13	7	11	9	89	83	87	97			ESTJ				
F1	4	6	17	3	15	5	18	2	105	73	79	69			ISTJ				
F2	8	2	8	12	9	11	15	5	89	109	103	81			ENFJ				
F3	6	4	8	12	11	9	7	13	97	109	95	113			ENTP				

TABLE 26 - CONTINUED

Section Member	COUNT													TYPE
	E	I	S	N	T	F	J	P	EI	SN	TF	JP	Continuous Score	
G1	7	3	16	4	18	2	20	0	93	77	67	61	ESTJ	
G2	7	3	6	14	10	10	10	10	93	117	99	101	ENTP	
G3	8	2	9	11	7	13	14	6	89	105	111	85	ENFJ	
G4	6	4	14	6	14	6	15	5	97	85	83	81	ESTJ	
G5	5	5	13	7	2	18	13	7	101	89	131	89	ISFJ	
G6	1	9	13	7	15	5	16	4	117	89	79	77	ISTJ	
H4	4	6	12	8	13	7	13	6	105	93	87	87	ISTJ	
H5	1	9	14	6	19	1	16	4	117	85	63	77	ISTJ	
H6	8	2	10	10	7	13	16	4	89	101	111	77	ENFJ	
I1	4	6	11	9	10	10	11	9	105	97	99	97	ISTJ	
I2	6	4	14	6	13	6	18	2	97	85	85	69	ESTJ	
I3	3	7	14	6	19	1	19	1	109	85	63	65	ISTJ	
I4	4	6	8	12	7	13	8	12	105	109	111	109	INFP	
I5	9	1	11	8	10	10	17	3	85	95	99	73	ESTJ	
I7	0	10	19	1	13	7	17	3	121	65	87	73	ISTJ	
J1	7	3	6	14	9	11	17	3	93	117	103	73	ENFJ	
J3	5	5	9	11	7	13	12	8	101	105	111	93	INFJ	
J6	4	6	13	7	10	10	16	4	105	89	99	77	ISTJ	
J7	8	2	9	11	7	13	13	7	89	105	111	89	ENFJ	
J8	5	5	11	9	6	14	16	4	101	97	115	77	ISFJ	
K1	6	4	13	7	10	9	11	8	97	89	97	95	ESTJ	
L1	5	5	11	9	7	13	10	10	101	97	111	101	ISFP	

TABLE 26 - CONTINUED

Section Member	COUNT													Continious Score				TYPE
	E	I	S	N	T	F	J	P	EI	SN	TF	JP						
L2	5	5	10	9	15	5	18	2	101	99	79	69			ISTJ			
M3	6	4	10	10	9	11	9	11	97	101	103	105			ENFP			
M4	2	8	6	14	9	10	12	8	113	117	101	93			INFJ			
M5	2	8	10	10	9	11	13	7	113	101	103	89			INFJ			
M6	9	1	18	2	18	2	16	4	85	69	67	77			ESTJ			
N2	4	6	15	5	15	5	15	5	105	81	79	81			ISTJ			
N3	8	2	16	4	12	8	16	4	89	77	91	77			ESTJ			
N4	8	2	12	8	9	11	17	3	89	93	103	73			ESEJ			
N5	9	1	9	11	7	13	10	10	85	105	111	101			ENFP			
N7	7	3	10	10	7	13	10	10	93	101	111	101			ENFP			
N8	3	7	9	10	12	8	16	2	109	103	91	73			INTJ			
O1	7	3	10	10	10	10	17	3	93	101	99	73			ENTJ			
O2	4	6	9	11	16	4	18	2	105	105	75	69			INTJ			
O3	7	3	7	12	6	12	12	8	93	111	111	93			ENFJ			
O4	9	1	11	9	13	7	9	11	85	97	87	105			ESTP			
O5	3	7	16	4	15	5	16	4	109	77	79	77			ISTJ			
O6	8	2	13	7	9	11	8	12	89	89	103	109			ESFP			
P1	3	7	14	6	15	5	18	2	109	85	79	69			ISTJ			
P2	7	3	13	6	14	6	16	4	93	87	83	77			ESTJ			
P5	4	6	11	9	13	7	16	4	105	97	87	77			ISTJ			
P6	8	2	14	6	11	9	16	4	89	85	95	77			ESTJ			
Q1	1	9	15	5	18	2	19	1	117	81	67	65			ISTJ			

APPENDIX D

COMMENTS FROM QUESTIONNAIRES

E (SL) - The employees that are working for me are a good bunch that have plenty of capacity and enthusiasm. Delegating work to them, with the understanding that I can always help them, is my normal mode. With a less capable crew, some of the areas of this questionnaire in which my response indicates that I don't directly monitor what they are doing, say #11 and #22, might indicate a problem. Under the current circumstances it is more a reasonable equilibrium which reflects the trust that I have in them.

F (SL) - The selection of UNCERTAIN, to me, implies that I don't know what I'm doing. Consequently I never used it. I am surely not going to let my superiors know, through my own admissions, that I don't know where I stand on what seems to be simple and basic management questions. [In response to the answer for question 19.]

J (SL) - Am an MBA student at American University.
[Comment on answer to question 3.]

N (SL) - I feel that <company name> needs a better Mgnt Training Program. This might lead to better consistancy [sic] among managers throughout <company name>. I also feel <company name> tries to make managers out of too many excellent technical people (due to their promotional system). They need to stress the importance of keeping technical people technical.

I4 - I haven't really been assigned any work from my section leader; therefore, most of these questions do not apply.

E1 - My section leader is very smart but doesn't know how to pass down his knowledge to others in his section. Very often he loses track of what others in his section are doing. Gives work to the same old people, new hires if not self starters often sit around and do nothing for quite awhile.

P5 - My former section leader expressed his opinions mostly at evaluation time rather than periodically during the year.

H4 - My section leader has confidence in my ability.

A6 - My S.L. is generally very efficient in all administrative work as well as being able to treat the section with the utmost respect they deserve. This attitude allows the section (and even encourages them) to do their job with a maximum amount of effort.

N2 - I do not feel that I am really qualified to answer many of the questions. I have worked with my section leader for only 5 months and during that time he has spent most of his time working on another project. My section leader came to our group with no knowledge of the programs we work on so he has had to rely on those of us with knowledge of the programs for technical decisions. The answers I have given are based more on my perception of him

as a person and not as a technical leader. I feel that much more useful answers would be obtained if I were to fill out these same questions about my old section leader who I worked for 18 months.

E3 - The section leader is very technically competent but is lacking in some managerial skills.

B5 - He sometimes either doesn't fully obtain all the needed information about completing a task or doesn't fully express them to me. This is mostly a <company name> problem with lines of communication between managerial/technical levels.

E4 - My section leader is a technical wiz, but managerial nightmare - he keeps bad hours and rarely has any idea about what any member of the section is working on.

E6 - My section leader is a good person. If there's one thing I could change though, it would involve his communications with others. Too often he is misunderstood because of the large or unfamiliar words he uses. More importantly, I feel he often uses 30 words to express something that could be conveyed in 10 words. (Therefore, my attention often drifts elsewhere when listening to him.) In other words he often goes over my head with answers to questions. Therefore, I usually take my questions to the most knowledgeable members in my section. This isn't a complaint but rather a requested comment that may benefit him in the future.

O2 - My section leader does not usually have me working for him full time. I usually work on long term projects rather than specific section leader assigned tasks.

N5 - Since the reorganazation [sic] of the department in January, I have had a new section leader who came from another department. And since that time in January, I have not had the opportunity to really deal with my section leader on a technical basis due to being on travel to <company B> and my section leader being involved on a contract proposal team. That makes it very hard to evaluate the performance of my section leader in the technical and management areas.

M4 - I believe my section leader has gotten better with experience on the job. This is especially true in the area of delegation of work. If there is one shortcoming, it is lack of a definite time table on some tasks.

C1 - Section leader assigns a task to someone and then when the person does not have it done he gives it to another to hurriedly complete it. If a task is not rushed to be done and is assigned to someone else (such as a problem (trouble report)) and someone else does it he is upset that it was done by someone other than the person assigned even though the TR may have been sitting around for a month. The section leader only sees what tasks are given and if they're completed. He does not see the real workings of the section and what is going on and does not speak up

and confront individuals when he sees poor performance or lack of ambition in job attitude and bad work ethics.

Q1 - Since I tend to be very self-motivated, in general, I discover, schedule, and solve problems with very little direction from my section leader. He does keep track of what is going on, but usually lets me handle things on my own terms.

M5 - In reference to item 3 for this section. I find that all sections [sic] leaders tend to tell their section members little about their performance during the year. The only time I receive any comments is at appraisal[sic] time. I would rather get feedback through the year.

N4 - Some of the above statements were difficult since I have not been working for my section leader for very long. (approximately 4 months)

APPENDIX E

SUMMARY DESCRIPTIVE STATISTICS

TABLE 27

SUMMARY DESCRIPTIVE STATISTICS OF SECTION LEADERS' ANSWERS
MINUS SECTION MEMBERS' ANSWERS FOR QUESTIONS B10 THROUGH C22

Statistic	b10	b11	b12
Sample size	63	63	63
Mean	0.47619	0.492063	0.539683
Median	0	0	1
Mode	0	0	1
Variance	0.866359	0.89913	1.22017
Standard deviation	0.930784	0.948224	1.10461
Standard error	0.117268	0.119465	0.139168
Minimum	-1	-1	-3
Maximum	3	3	3
Range	4	4	6
Lower quartile	0	0	0
Upper quartile	1	1	1
Interquartile range	1	1	1
Skewness	0.629272	0.726868	-0.0294762
Standardized skewness	2.03908	2.35532	-0.0955139
Kurtosis	0.391972	0.741563	1.26018
Standardized kurtosis	0.635067	1.20147	2.04173

TABLE 27 - CONTINUED

Statistic	b13	b14	b15
Sample size	63	63	63
Mean	0.666667	0.857143	0.539683
Median	0	1	0
Mode	0	1	0
Variance	1.25806	1.447	0.897593
Standard deviation	1.12163	1.20292	0.947414
Standard error	0.141313	0.151553	0.119363
Minimum	-2	-1	-1
Maximum	3	4	3
Range	5	5	4
Lower quartile	0	0	0
Upper quartile	1	2	1
Interquartile range	1	2	1
Skewness	0.417109	0.168745	0.705104
Standardized skewness	1.35159	0.546797	2.2848
Kurtosis	-0.104713	-0.349864	0.0624094
Standardized kurtosis	-0.169655	-0.566844	0.101115

TABLE 27 - CONTINUED

Statistic	b16	c17	c18
Sample size	63	63	63
Mean	0.412698	0.603175	0.285714
Median	0	1	0
Mode	0	1	0
Variance	1.21403	0.791603	2.33641
Standard deviation	1.10183	0.889721	1.52853
Standard error	0.138818	0.112094	0.192577
Minimum	-2	-1	-3
Maximum	3	3	4
Range	5	4	7
Lower quartile	0	0	-1
Upper quartile	1	1	1
Interquartile range	1	1	2
Skewness	0.378329	0.0322742	0.253592
Standardized skewness	1.22592	0.10458	0.821731
Kurtosis	-0.0513127	-0.0535063	0.144856
Standardized kurtosis	-0.083136	-0.0866901	0.234693

TABLE 27 - CONTINUED

Statistic	c19	c20	c21
Sample size	63	63	63
Mean	0.492063	0.380952	0.0634921
Median	0	0	0
Mode	1	0	0
Variance	1.28623	1.40092	1.09268
Standard deviation	1.13412	1.18361	1.04531
Standard error	0.142886	0.14912	0.131697
Minimum	-2	-2	-2
Maximum	4	3	2
Range	6	5	4
Lower quartile	0	0	-1
Upper quartile	1	1	1
Interquartile range	1	1	2
Skewness	0.49987	0.655526	0.0449172
Standardized skewness	1.61976	2.12415	0.145548
Kurtosis	0.686627	0.032519	-0.389032
Standardized kurtosis	1.11246	0.0526867	-0.630303

TABLE 27 - CONTINUED

Statistic	c22	B10 to C22 sum	B10 to C22 average
Sample size	63	63	63
Mean	0.619048	6.42857	0.494505
Median	1	6	0.461538
Mode	1	1	0.0769231
Variance	1.69124	57.2166	0.33856
Standard deviation	1.30048	7.56416	0.581859
Standard error	0.163845	0.952995	0.0733073
Minimum	-3	-8	-0.615385
Maximum	3	26	2
Range	6	34	2.61538
Lower quartile	0	1	0.0769231
Upper quartile	2	12	0.923077
Interquartile range	2	11	0.846154
Skewness	-0.383838	0.342131	0.342131
Standardized skewness	-1.24378	1.10863	1.10863
Kurtosis	-3305	-0.219763	-0.219763
Standardized kurtosis	-0.232181	-0.356057	-0.356057

TABLE 28

SUMMARY DESCRIPTIVE STATISTICS OF TYPE PREFERENCE SCORES

Statistic	EIpref	SNpref	TFpref
Sample size	63	63	63
Mean	7.69841	11.1587	13.3175
Median	7	11	11
Mode	5	11	11
Geometric mean	5.87768	7.89656	9.36258
Variance	23.2463	65.4583	86.3492
Standard deviation	4.82144	8.09063	9.29243
Standard error	0.607444	1.01932	1.17074
Minimum	1	1	1
Maximum	21	35	37
Range	20	34	36
Lower quartile	5	5	5
Upper quartile	11	15	21
Interquartile range	6	10	16
Skewness	0.54437	0.85086	0.721858
Standardized skewness	1.76396	2.7571	2.33909
Kurtosis	-0.251059	0.370701	0.0766153
Standardized kurtosis	-0.406762	0.600605	0.124131

TABLE 28 - CONTINUED

Statistic	JPpref	EIcont	SNcont
Sample size	63	63	63
Mean	17.8889	99.381	94.7778
Median	19	101	95
Mode	23	105	89
Geometric mean	12.6513	98.9735	93.9152
Variance	116.358	83.0783	164.272
Standard deviation	10.787	9.11473	12.8169
Standard error	1.35903	1.14835	1.61478
Minimum	1	85	65
Maximum	39	121	129
Range	38	36	64
Lower quartile	7	93	85
Upper quartile	27	105	105
Interquartile range	20	12	20
Skewness	-0.0771101	0.274842	0.110627
Standardized skewness	-0.249865	0.890589	0.358472
Kurtosis	-1.18075	-0.695247	-0.0929111
Standardized kurtosis	-1.91303	-1.12643	-0.150533

TABLE 28 - CONTINUED

Statistic	TFcont	JPcont
Sample size	63	63
Mean	93.5079	84.0476
Median	95	81
Mode	111	77
Geometric mean	92.3011	83.0064
Variance	223.738	182.949
Standard deviation	14.9579	13.5259
Standard error	1.88451	1.7041
Minimum	63	61
Maximum	131	113
Range	68	52
Lower quartile	79	73
Upper quartile	107	95
Interquartile range	28	22
Skewness	-4.98821E-3	0.445035
Standardized skewness	-0.0161636	1.44208
Kurtosis	-0.581194	-0.916646
Standardized kurtosis	-0.941641	-1.48514

APPENDIX F

CHI-SQUARE VALUES

TABLE 29

CHI-SQUARE VALUES FOR QUESTION B10

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-.500	7	9	.5558
-.500	.500	29	23	1.6411
.500	1.500	19	22	.4909
above 1.500		8	9	.0351
Chi-square = 2.72278 with 1 d.f. Sig. level = 0.0989256				

TABLE 30

CHI-SQUARE VALUES FOR QUESTION B11

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-.500	7	9	.5717
-.500	.500	28	22	1.3979
.500	1.500	21	22	.0674
above 1.500		7	9	.4706
Chi-square = 2.50761 with 1 d.f. Sig. level = 0.113297				

TABLE 31

CHI-SQUARE VALUES FOR QUESTION B12

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-.500	9	11	.3358
-.500	.500	21	20	.0886
.500	1.500	25	20	1.0951
above 1.500		8	12	1.3984
Chi-square = 2.91887 with 1 d.f. Sig. level = 0.0875489				

TABLE 32

CHI-SQUARE VALUES FOR QUESTION B13

	Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below		-.500	6	9	1.2271
	-.500	.500	27	18	4.0387
	.500	1.500	16	21	1.1117
above	1.500		14	14	.0117
Chi-square = 6.38921 with 1 d.f. Sig. level = 0.0114816					

TABLE 33

CHI-SQUARE VALUES FOR QUESTION B14

	Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below		-.500	10	8	.41200
	-.500	.500	13	16	.55581
	.500	1.500	22	20	.16550
	1.500	2.500	13	13	.00519
above	2.500		5	5	.03237
Chi-square = 1.17087 with 2 d.f. Sig. level = 0.556864					

TABLE 34

CHI-SQUARE VALUES FOR QUESTION B15

	Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below		-.500	5	9	1.496
	-.500	.500	32	22	4.698
	.500	1.500	15	23	2.648
above	1.500		11	10	.150
Chi-square = 8.99147 with 1 d.f. Sig. level = 2.71243E-3					

TABLE 35

CHI-SQUARE VALUES FOR QUESTION B16

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-.500	13	13	.00211
-.500	.500	22	21	.08770
.500	1.500	19	19	.00507
above 1.500		9	10	.14064

Chi-square = 0.235519 with 1 d.f. Sig. level = 0.627462

TABLE 36

CHI-SQUARE VALUES FOR QUESTION C17

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-.500	7	7	.00763
-.500	.500	20	22	.15166
.500	1.500	28	25	.48960
above 1.500		8	10	.25567

Chi-square = 1.00455 with 1 d.f. Sig. level = 0.316212

TABLE 37

CHI-SQUARE VALUES FOR QUESTION C18

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-1.500	7	8	.0544
-1.500	-.500	10	11	.1914
-.500	.500	22	16	2.3545
.500	1.500	11	15	.8614
above 1.500		13	13	.0150

Chi-square = 3.47669 with 2 d.f. Sig. level = 0.175811

TABLE 38

CHI-SQUARE VALUES FOR QUESTION C19

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-.500	12	12	.0000476
-.500	.500	20	20	.0061575
.500	1.500	22	20	.3101128
above 1.500		9	12	.6583340

Chi-square = 0.974652 with 1 d.f. Sig. level = 0.323523

TABLE 39

CHI-SQUARE VALUES FOR QUESTION C20

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-.500	14	14	.0104
-.500	.500	25	20	1.4641
.500	1.500	14	18	.9395
above 1.500		10	11	.0665

Chi-square = 2.48049 with 1 d.f. Sig. level = 0.115267

TABLE 40

CHI-SQUARE VALUES FOR QUESTION C21

Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below	-.500	18	19	.0181
-.500	.500	25	23	.1531
.500	1.500	14	16	.2422
above 1.500		6	5	.0829

Chi-square = 0.496375 with 1 d.f. Sig. level = 0.481097

TABLE 41

CHI-SQUARE VALUES FOR QUESTION C22

	Lower Limit	Upper Limit	Observed Frequency	Expected Frequency	Chi-square
at or below		-.500	13	12	.0435
	-.500	.500	14	17	.5079
	.500	1.500	19	18	.0441
above	1.500		17	16	.1091
Chi-square = 0.704546 with 1 d.f. Sig. level = 0.40126					

APPENDIX G

GRAPHS OF B10 THROUGH C22 DELTAS

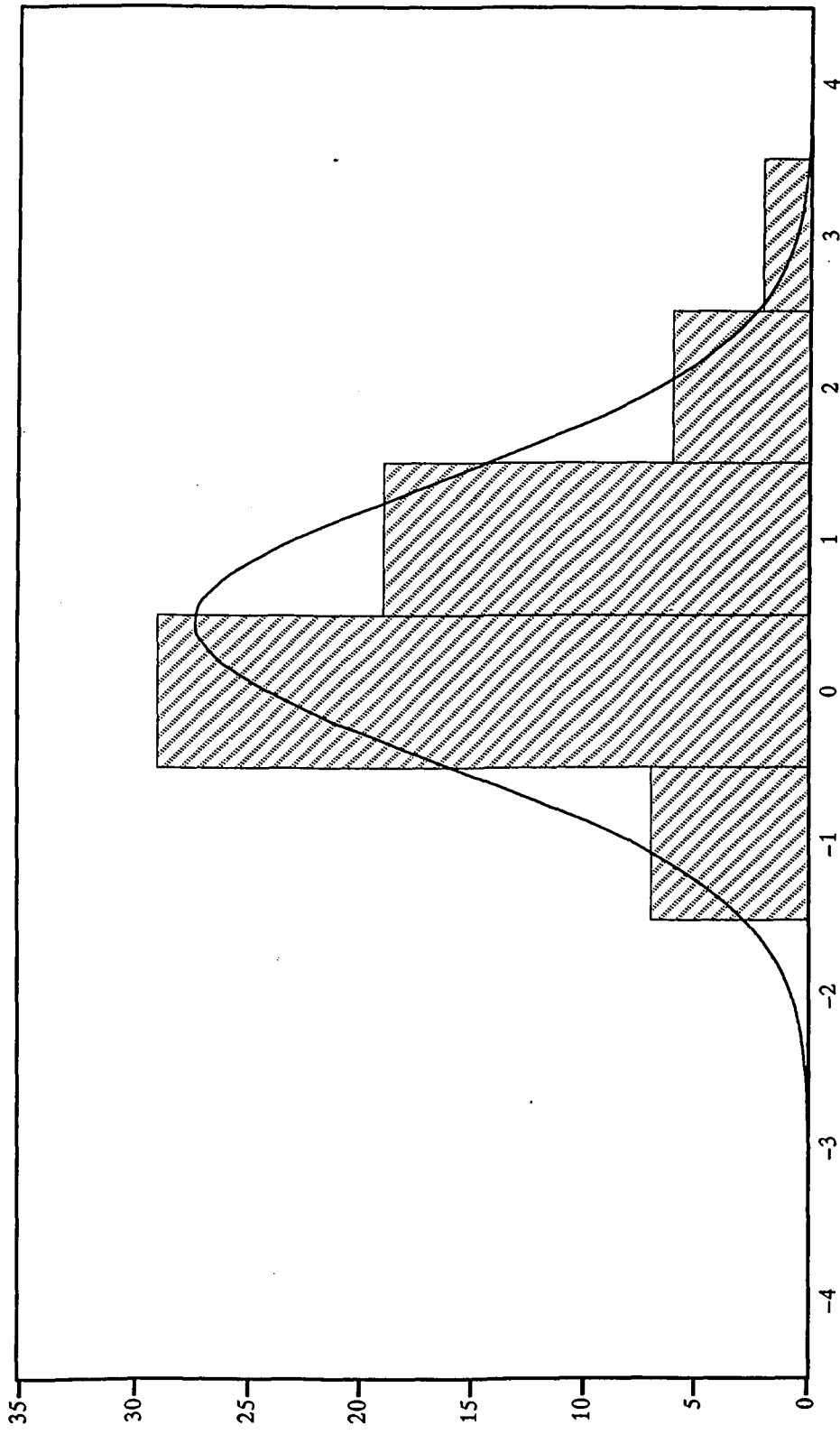


Figure 5
B10 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

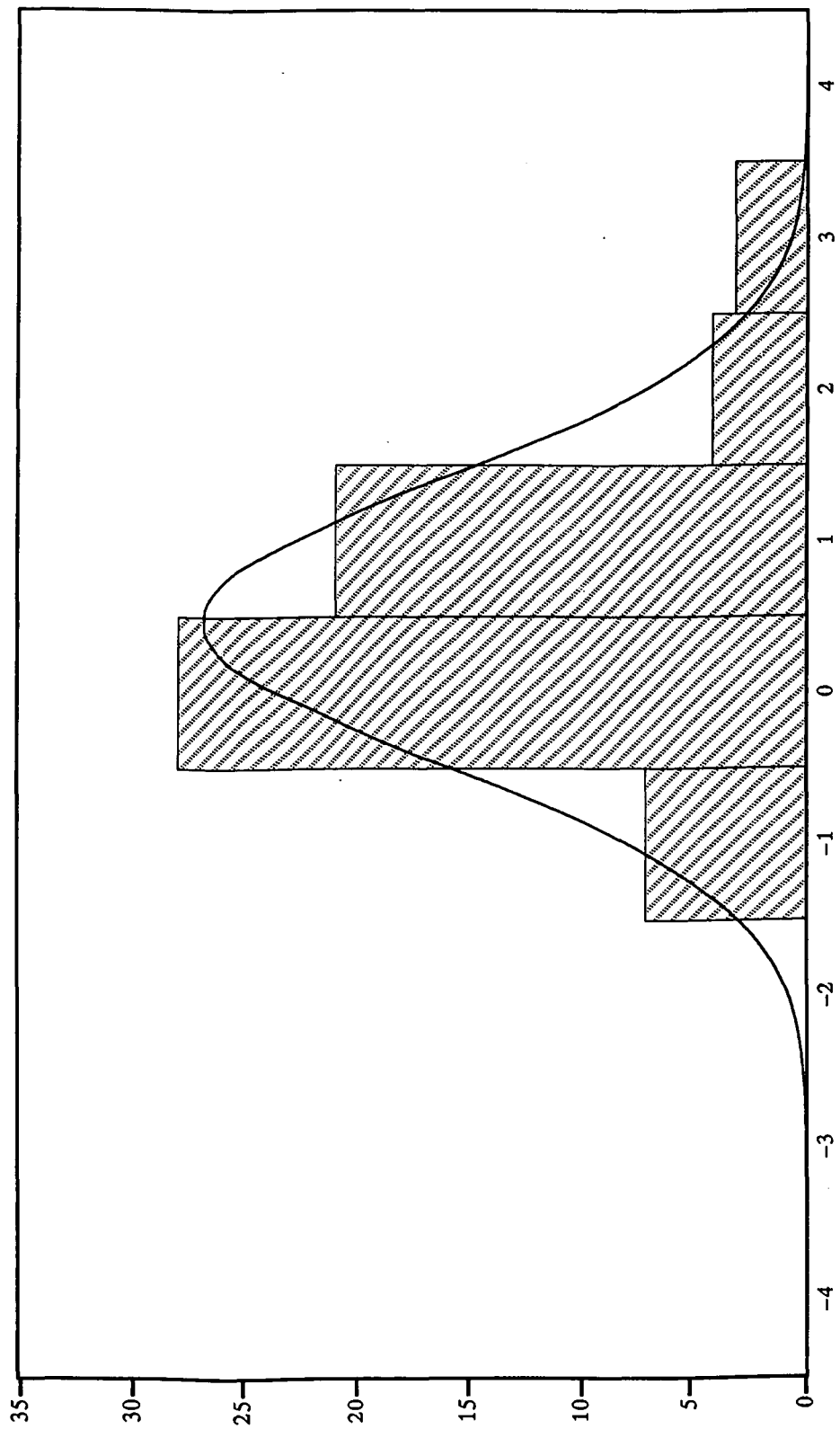


Figure 6
B11 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

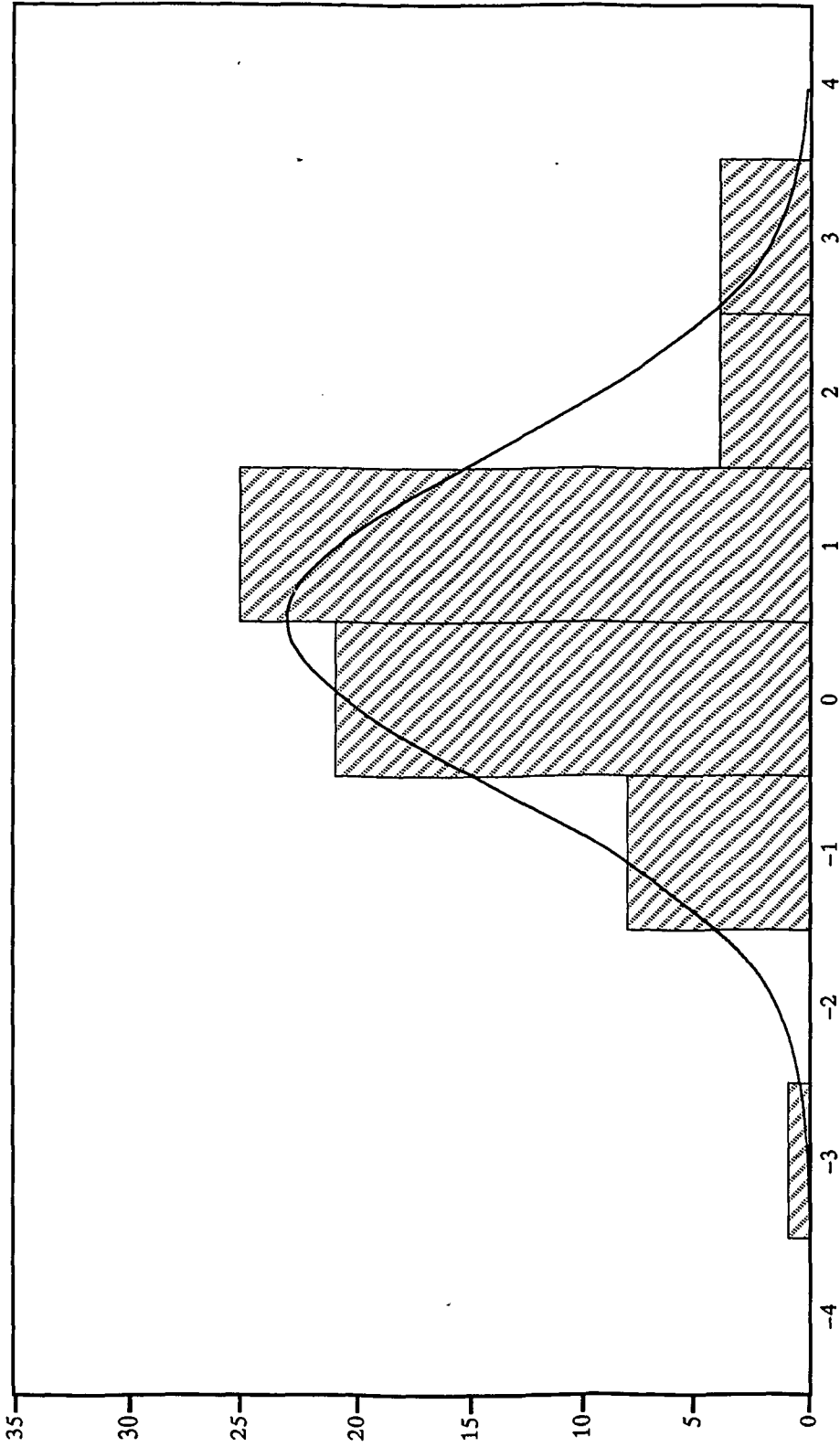


Figure 7
B12 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

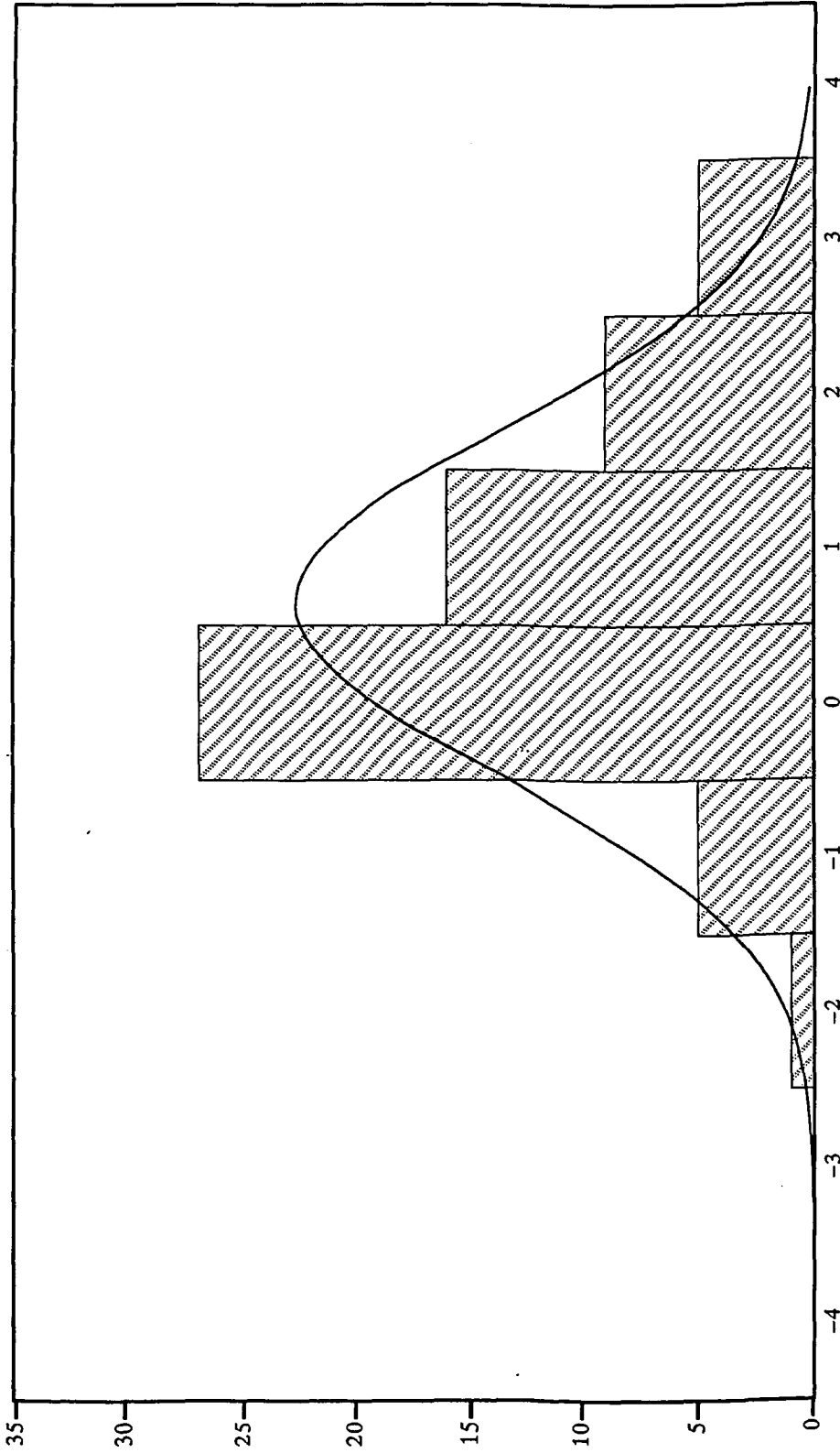


Figure 8
B13 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

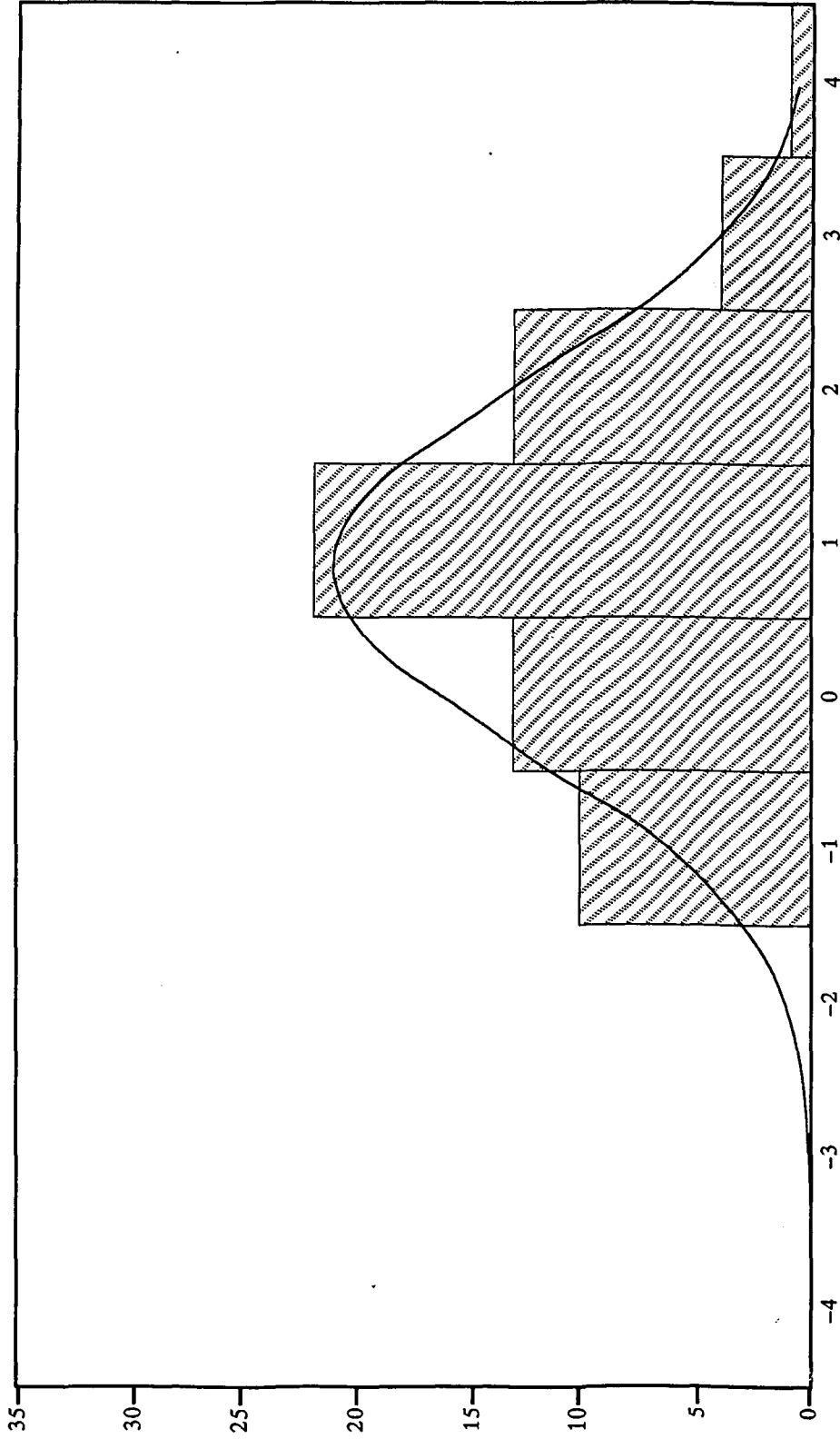


Figure 9
B14 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

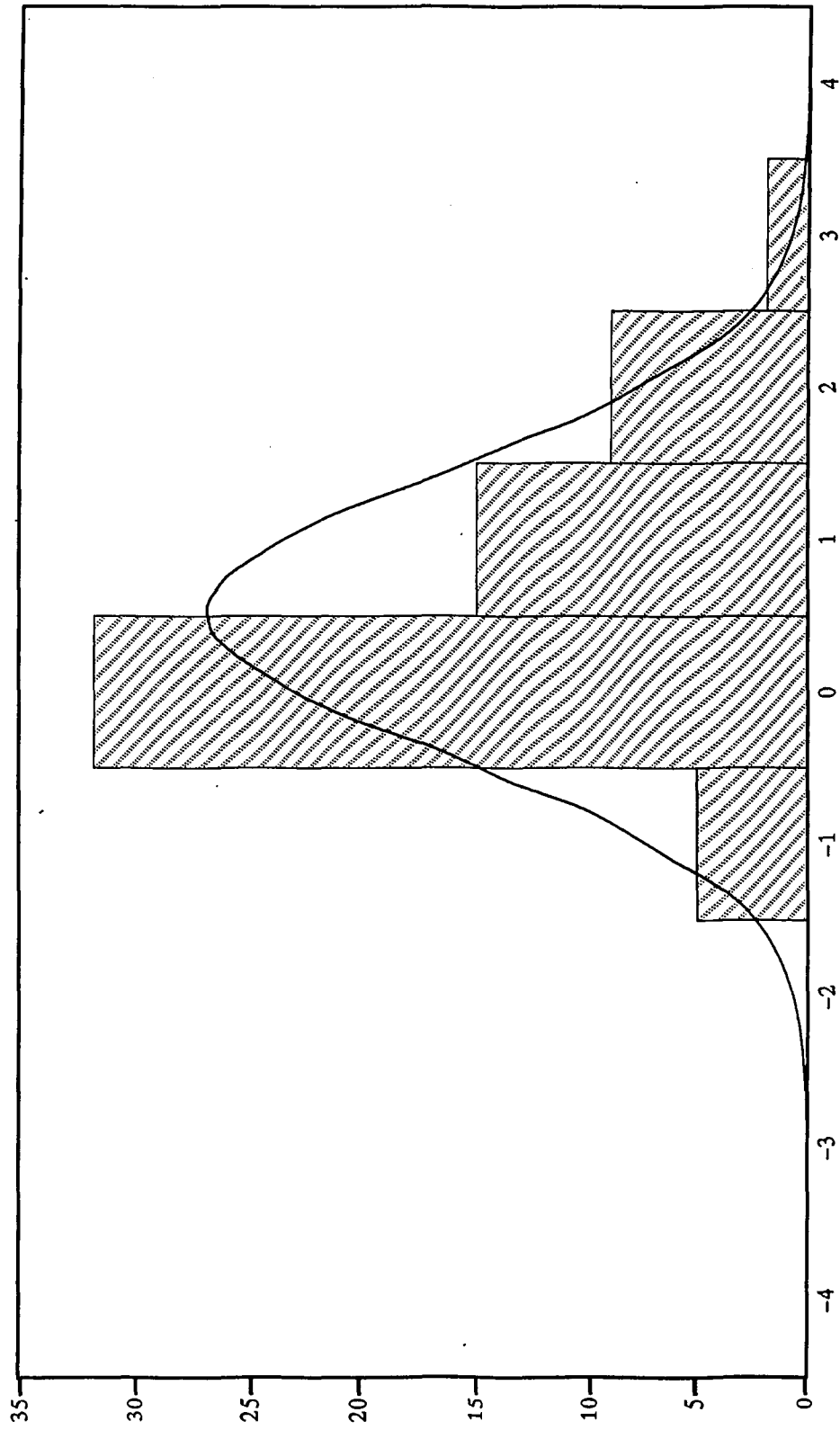


Figure 10
B15 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

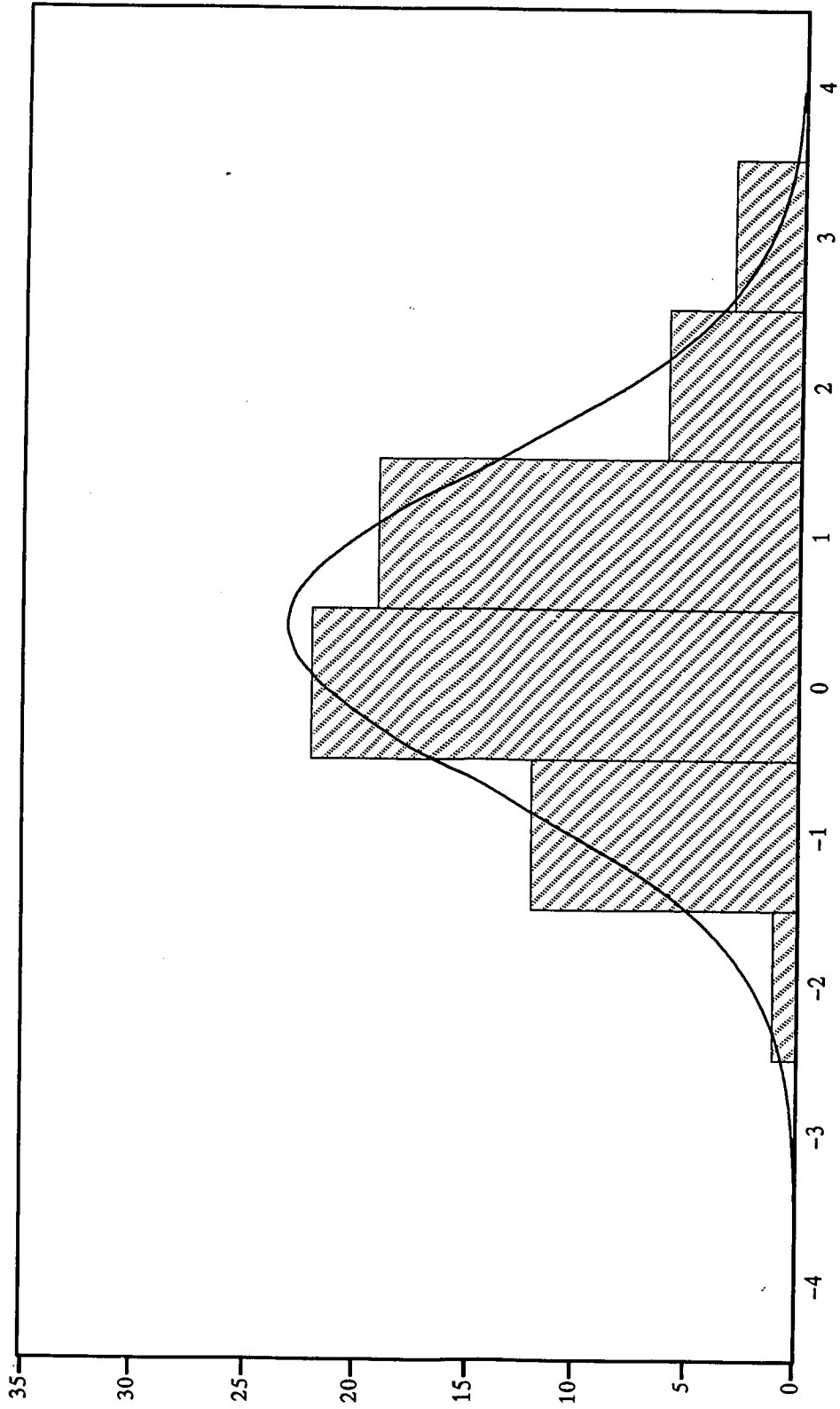


Figure 11
B16 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

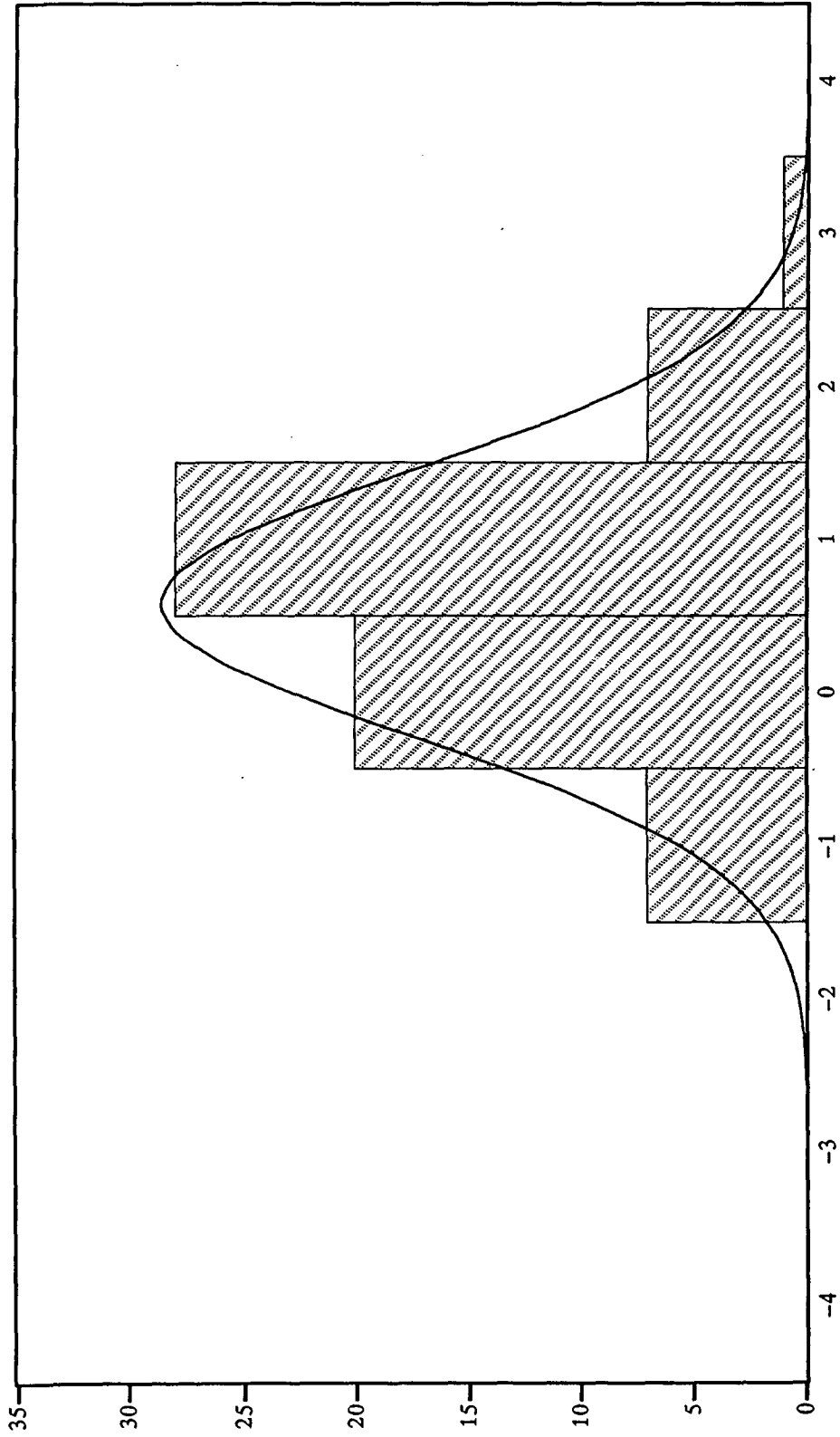


Figure 12
C17 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

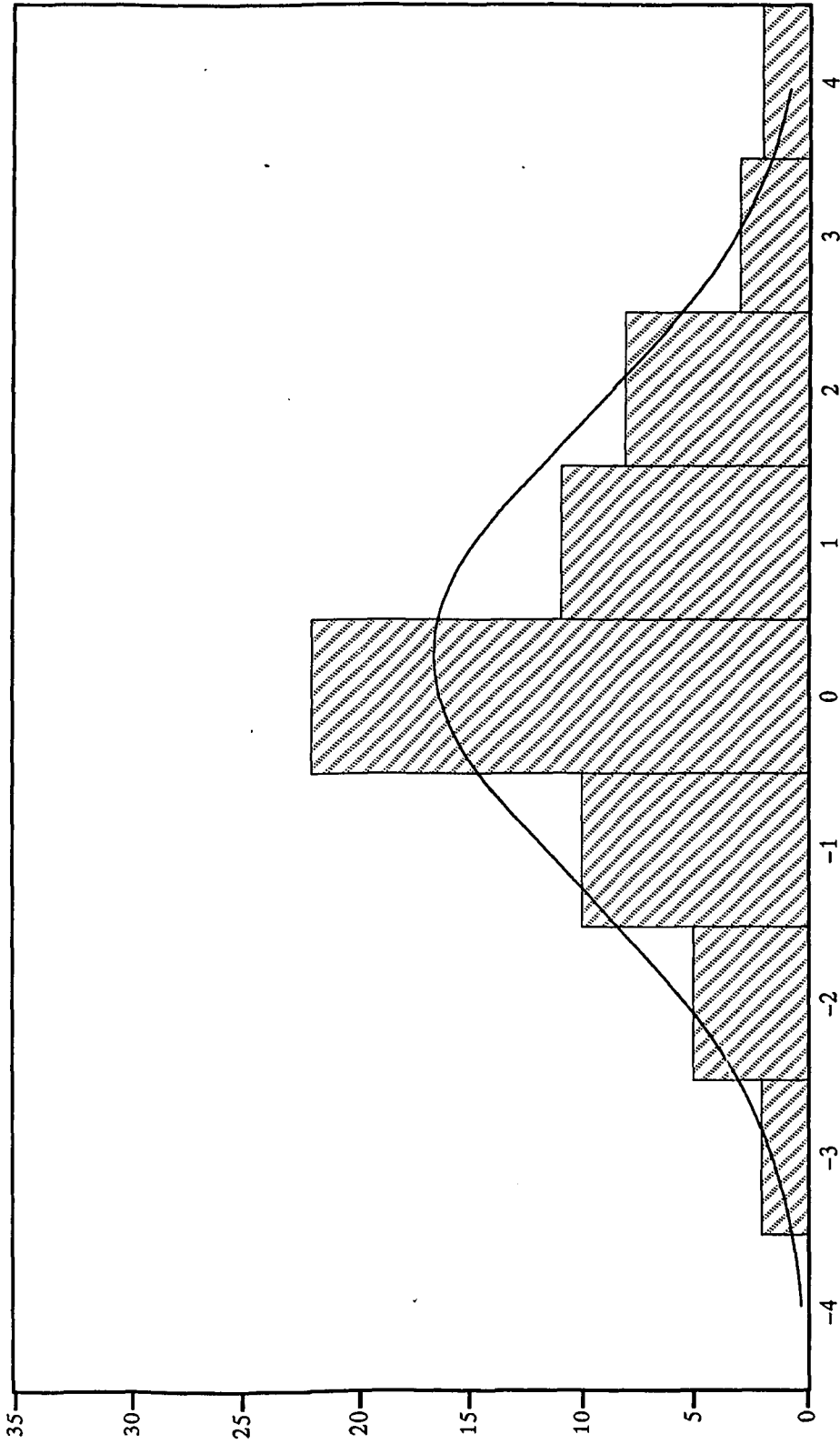


Figure 13
C18 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

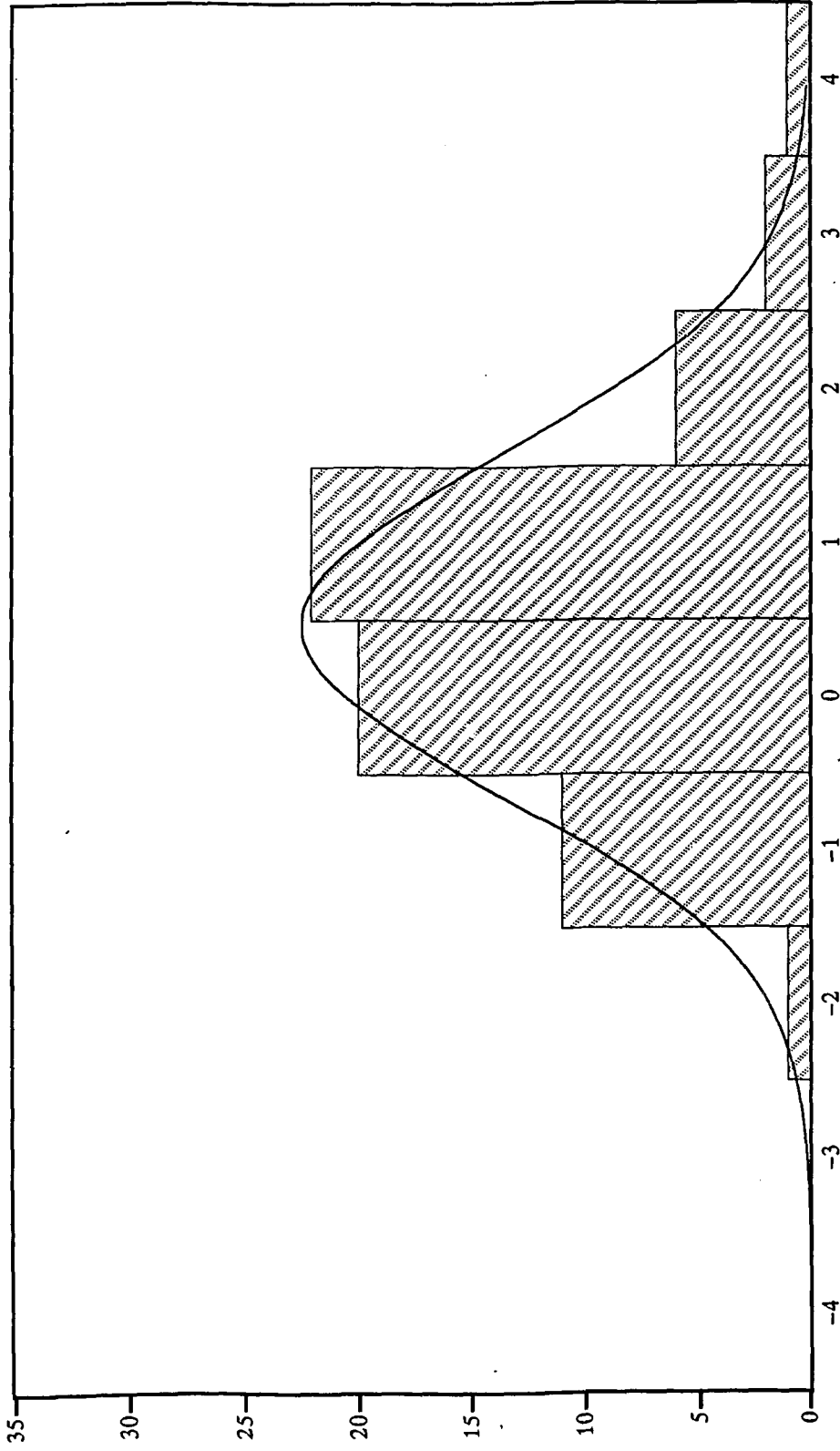


Figure 14
C19 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

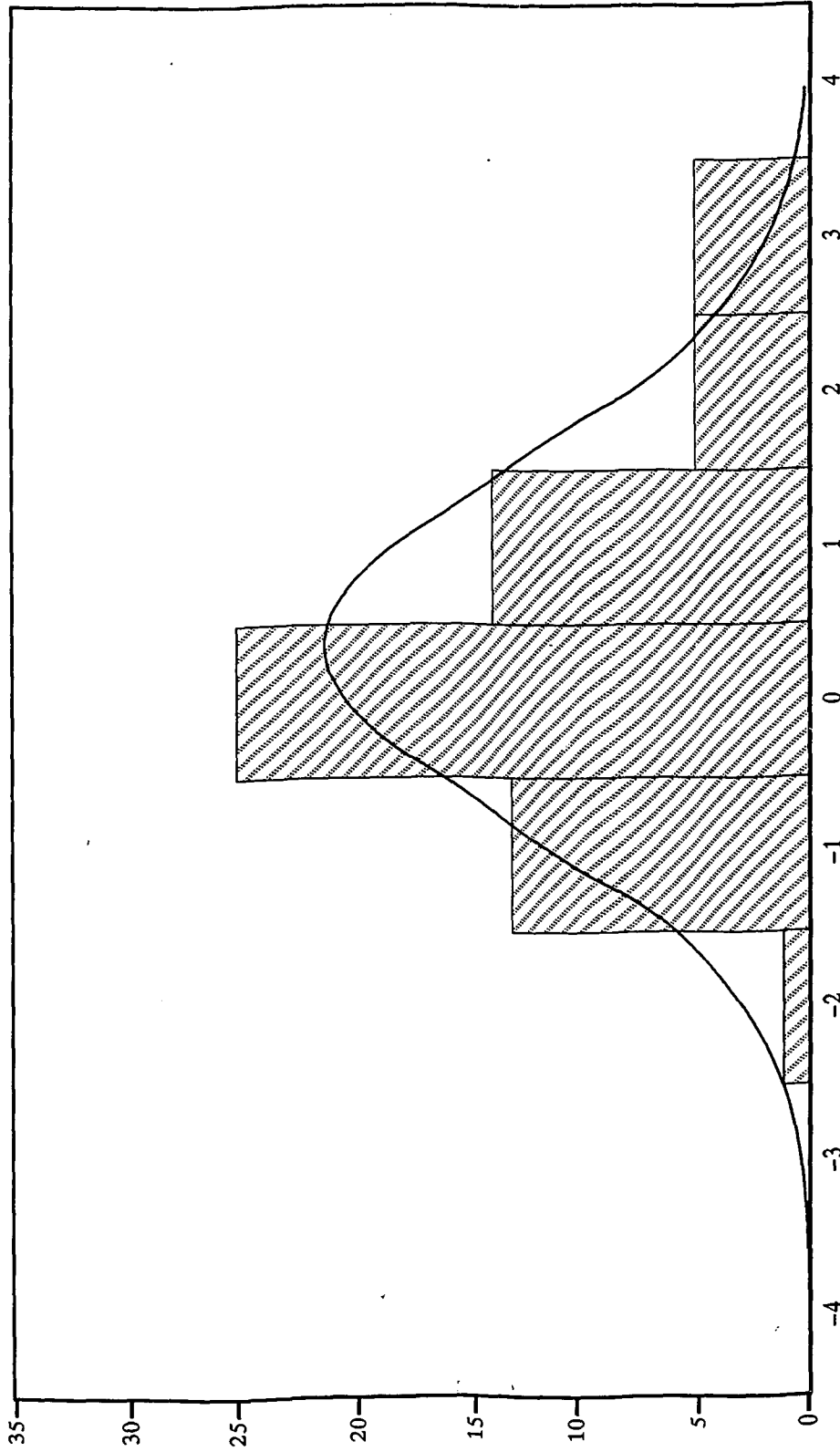


Figure 15
C20 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

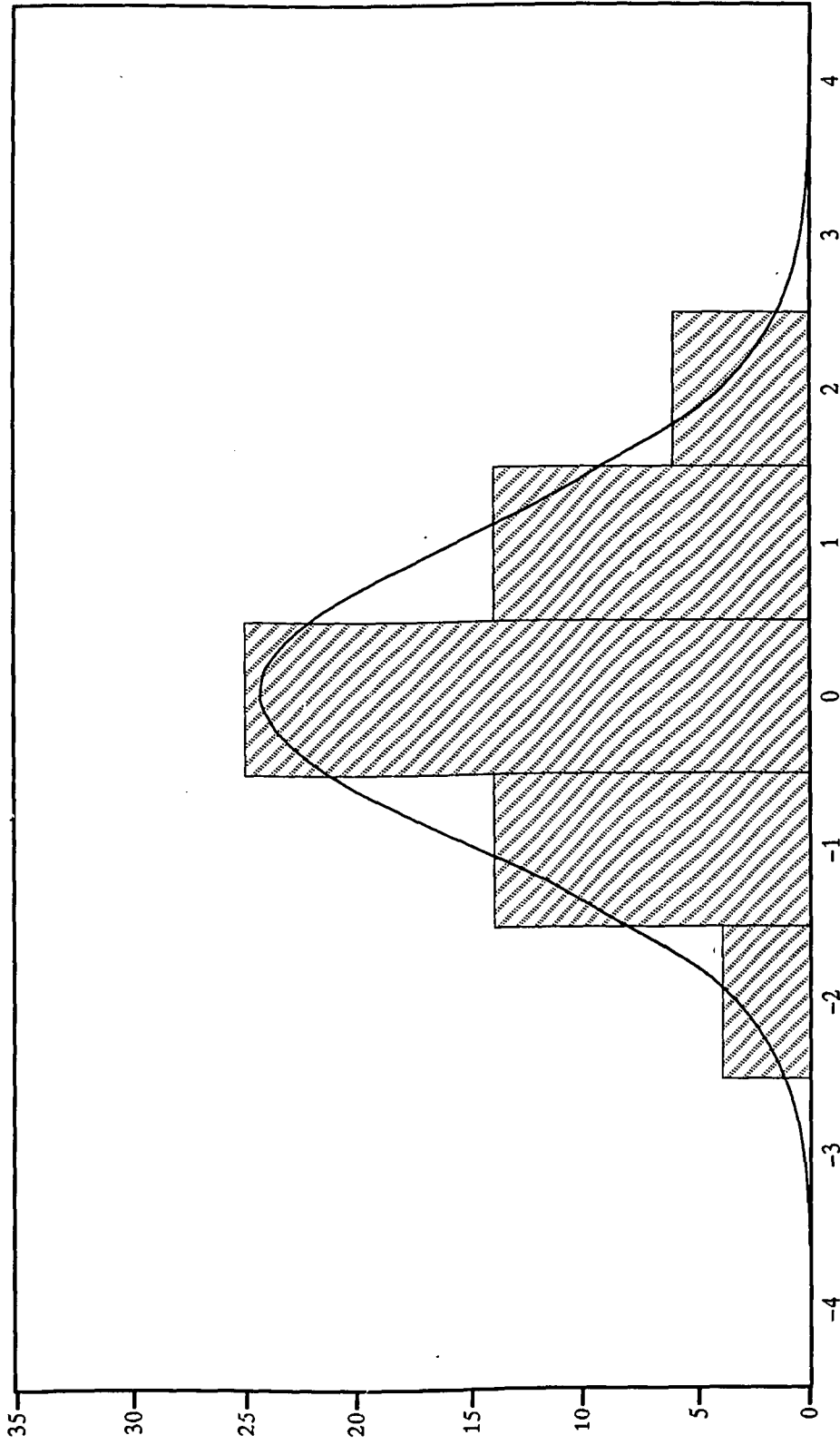


Figure 16
C21 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

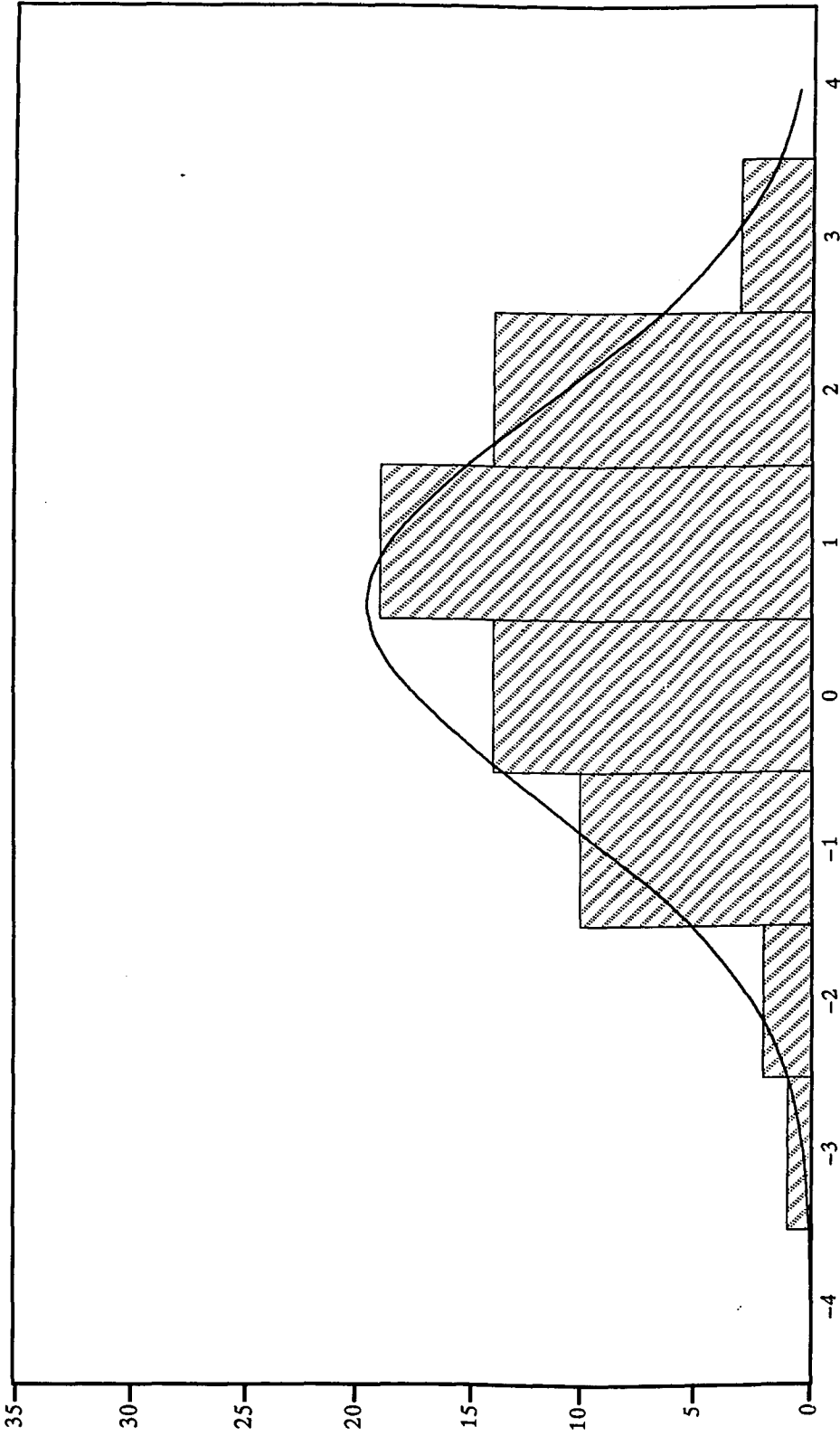


Figure 17
C22 Deltas (Section Leaders' Answers Minus Section Members Answers) Superimposed by
Normal Distribution Curve of the Mean and Standard Deviation of the Deltas

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