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THE RELATIONSHIP OF BRAIN HEMISPHERE DOMINANCE TO THE PROFESSIONAL DEVELOPMENT OF CHIEF EDUCATIONAL ADMINISTRATORS

By

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ABSTRACT

THE RELATIONSHIP OF BRAIN HEMISPHERE DOMINANCE TO THE PROFESSIONAL DEVELOPMENT OF CHIEF EDUCATIONAL ADMINISTRATORS

By

Leslie Lyn Wessman

During the past three decades American educational institutions have moved from rapid growth and abundant resources to population declines and eroding financial funding. The turbulent sixties caused many a chief administrator to think seriously about the loss of power, prestige, clarity, and certainty from the positions of president and superintendent. Though the times are not as turbulent in the eighties, rapid changes have begun, and more appear on the horizon. Within this context of ambiguity and change, the purpose of the study was to initiate some brain dominance research of chief educational administrators to determine what personal and work elements are key in the present executive leadership in the State of Michigan, and to learn what cognitive processes might be developed to promote a balance of technical, intuitive, and conceptual skills.

The brain research, brain dominance, and management/ leadership literature was surveyed to determine cognitive potential and organizational needs for executive development.

Previous brain dominance studies have demonstrated that people gravitate toward occupations due to mental preferences, therefore utilizing "competencies" to reach personal and organizational goals.

This descriptive study surveyed voluntary subjects who are public college/university presidents, school superintendents, and top level administrators in academic affairs and finance who represent the most ready pool of future education executives. Two hundred thirty-two subjects completed the Herrmann Brain Dominance Instrument, providing several measurements of brain dominance including a dominance profile code, right/left and cerebral/limbic dominance raw scores, key descriptors, and scaled scores for the dominance "degree" in each of four quadrants. There were four major findings: 1) Chief administrators are characterized by a style predominantly left-brained in orientation; 2) Top level administrators with responsibility for academic and financial affairs are characterized by a style congruent with the content of their work; 3) A cognitive style which utilizes interpersonal, intuitive, and emotional skills, and depends on the ability to express ideas, was the least preferred quadrant; 4) Chief administrators demonstrated a strong preference for the safe-keeping, maintaining elements of work, compared to the risk-taking, conceptualizing activities which lead organizations toward and through change.

This dissertation is

dedicated to

all those who

journeyed with me

on rocky road,

and pleasant path alike--

and encouraged me

to smell the flowers

along the way....

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The completion of this dissertation project has been a labor of sheer determination, as well as a stimulation of curiosity for learning experiences outside of the comfortable and successful corners of my life. There have been many individuals who have facilitated this process and have made the two-year journey both realistic and manageable.

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Sides of the Brain". The hospitality and friendship of Bob, and his wife Mill, have kept me safe, warm, and well-fed on many a cold night in East Lansing.

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Dr. Cass Gentry has been meticulous in his critiquing of my work, specific in his suggestions for improvement, and always inviting the consideration of implications. His personal enthusiasm for my project made the need for corrections and modifications livable.

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Dr. Russell Rogers showed me the doctoral study "ropes", provided the necessary measure for material inclusion--"the need- to-know versus the nice-to-know"--and has been an ever-present friend in toxic times, as well as a congruent professional partner in human resource development consulting.

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Thanks to all. There are flowers, even in research!

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CHAPTER I

THE PROBLEM

INTRODUCTION

Leaders in educational institutions have been widely criticized for a perceived ineffectiveness in adjusting to changing times. The turn-over rate among educational administrators is relatively high throughout all levels of education. This may occur in part because of advancement to better positions, but departure to less responsible positions does occur, often by choice for those who are judged to have failed. Such failure may occur for a variety of reasons, but inadequate preparation for leadership, failure to understand the uniqueness of leadership in education, and unrealistic expectations among constituents are surely among the most common causes.

A lack of responsiveness to change and significant executive turn-over rate are not peculiar to educational organizations. Most of the research directed toward organizational effectiveness in recent years has found that executives in most American organizations have "perfected their skills for maintaining and managing the existing organizational structure--yet they have been slow to respond as "change agents", "pathfinders," "statesmen", and "innovators" (Srivastva, 1986, p. 1).

Fifty years ago Barnard discussed the importance of executive thinking which he claimed incorporated both logical and non-logical thought in decision-making. He proposed that there were three purposes for executive mental effort: 1) "To ascertain truth, 2) to ascertain a course of action and 3) to persuade (1938, p. 235)." The last two purposes, he emphasized, should utilize a non-logical approach and incorporate intuitive and conceptual thought processes.

In 1955 Katz identified the three basic "Skills of the effective Administrator" as technical, human, and conceptual (1974, p. 91). After twenty years of experience with executives in American corporations, Katz revisited his discussion of administrative skills to insure a more balanced valuing of the concepts. Katz submits that strong leaders are not born, but rather have strong aptitudes and abilities which can be improved by practice and training--and even those who lack natural ability can learn to improve their effectiveness. He recognizes that technical skills have received great attention--too often at the expense of the other two. Of human skills, Katz argues that a focus on internal, intragroup skills is essential in lower and middle management roles, while the facilitation of cooperation and consensus between departments or competing groups--intergroup skills--is increasingly important in successively higher levels of management.

Wortman's studies (1982) indicate that executives think and act more strategically (long range) while lower level managers must be concerned with daily operations (short range). Other researchers have demonstrated that the chief executive intuitively becomes the instrument through which loyalties build, morale gets created, and people are motivated toward the accomplishment of organizational goals (Peters and Waterman, 1982; Bennis and Nanus, 1985).

Katz urges those who aspire to executive positions to learn a more holistic approach to thinking in concepts: "...thinking in terms of relative emphases and priorities among conflicting objectives and criteria; relative tendencies and probabilities (rather than certainties); and rough correlations and patterns among elements (rather than clear-cut cause-and-effect relationships)" (1974, p. 101). Educational organizations have been identified in organization development literature as "organized anarchies" (Cohen, March, and Olsen, 1972) or "loosely coupled systems" (Weick, 1982). In these fast-changing times, chief administrators are being encouraged to be responsible for managing a symbol system of key values in order

> ...to help people interpret what they are doing, strengthen action by giving persons an understanding of what might be happening and what can be done next, link people who might otherwise feel isolated, give people ways to describe what they do that will evoke interest and approval from others, and give people answers to puzzles they encounter (Weick, 1982, p. 676).

McKinney and Keen (1974) suggest that there is not one "right" way for executives to solve problems, but rather that there is a managerial cognitive style--a mode of thinking that is related more to propensity than to capacity--one which is holistic in nature. Schein (1985a) believes that the managerial cognitive style, or "career anchor", develops during an individual's career through combining one's conscious personal motives, needs, and values with his/her knowledge, skills and talents. As a result of his research on chief executive officers, Schein identified eight Career Anchors; the Managerial anchor is preferred by persons who discover as their career progresses that they really want to become *general* managers. They acknowledge a propensity for wanting to reach a level in the organization at which their managerial efforts and decisions will make a difference between organizational success and failure.

Schein identifies three areas of competence which are necessary for persons who eventually become the chief executives of organizations: 1) *Analytical competence*--the ability to identify, analyze, synthesize and to think cross-functionally and integratively; 2) *Interpersonal and Intergroup competence*--the ability to influence, supervise, lead, manipulate, and control people at all levels of the organization toward the achievement of organizational goals. 3) *Emotional competence*--the capacity to be stimulated by emotional and interpersonal issues and crises rather than exhausted or debilitated by them; the capacity to bear high

levels of responsibility without becoming paralyzed; and the ability to exercise power and make difficult decisions without experiencing guilt or shame.

Weick (1982) suggested that thinking is inseparably woven into and occurs simultaneously with executive action. Mintzberg (1976) applied brain hemisphere research to management theory, demonstrating through the observations of chief executive officers of five major corporations that a leader's intuitive assessment of situations and people within the organization is a primary source of information for decision-making and problem-solving.

Over the past thirty years brain research has presented an evolving, specific understanding of the specialized functions derived from brain structure. Researchers Roger Sperry (1975), Michael Gazziniga (1985), Paul McLean (1973), and Robert Ornstein (1984) continue to demonstrate the specialization, complexity, interdependency, and impressive capacity of the human brain. Brain dominance studies have begun to map patterns of mental preferences as they relate to career effectiveness (Coulson and Strickland, 1983; Norris, 1984; and Herrmann, 1982; 1986). Research confirms that "an individual will be able to attain higher competence on the job if there is a good match between mental preference and the work elements required to do the job" (Herrmann, 1986).

Organization development researchers and specialists are utilizing the evolving evidence from the neurosciences as one resource for examining executive behavior. (Bennis, 1982;

Kolb, 1982; Weick, 1983; Mintzberg and Waters, 1982; and Argyris, 1982). The conceptual and intuitive approaches to executive thought and action have been demonstrated as giving balance to the rational, analytical approaches which have been emphasized for the past thirty years in management training programs.

> "...the art of executive leadership is above all a taste for paradox, a talent for ambiguity, the capacity to hold contradictory propositions comfortably in a mind that relishes complexity (Cleveland, 1985, p. xv)."

Researchers (Mintzberg, 1976; Fry and Pasmore, 1983; Bennis and Nanus, 1985) believe that those who promote the training and selection of America's executive leadership should scrutinize their curricula and criteria to incorporate more holistic skills which are not typically given time or attention. A similar need exists in educational administration programs (Weick, 1982; Norris, 1984).

STATEMENT OF THE PROBLEM

Rationale

As the nation looks to the advent of the twenty-first century, it is experiencing significant changes in social and economic conditions which challenge American prosperity and economic leadership. International competition, a widened world community, and the advent of a service economy are placing new demands on higher education institutions to prepare students for rapidly changing skill requirements, job displacements, and career shifts rather than to primarily prepare students for singular, life-long careers.

Historically, the goal of education in America has been to instill a sense of common culture in our children, to transmit to them shared standards of behavior, and to prepare them for productive lives. Today--in times of rapid and profound changes in population, technology, the economy, the family structure, and in learning--this goal of cultural transmissions is increasingly difficult to achieve within the constraints of an educational system that was created to service an agrarian economy, then adapted to be responsive to the needs of industrialized growth (Naisbitt, 1982). Today the changing nature of families and a shift away from the authority of religion has burdened the education system, by default, with the responsibility of not only educating students, but also attending to their social and emotional needs. Educational institutions organized to accommodate a way of life 150 years old cannot prepare students technically, intellectually, and emotionally to be productive citizens in the twenty-first century. Major change is needed.

Legislators in the majority of states are attempting to take charge of educational reform for political reasons. Leaders in American corporations have become increasingly involved in the educational process of their workers for practical reasons, providing remedial courses in basic math and English for entry-level workers. American educational leadership--school superintendents and college and university presidents--must become more aggressive and articulate in

envisioning, presenting, promoting and empowering a more adaptive and self-renewing educational system. They are the key players in meeting current demands for improvement. In addition to rational problem-solving, they must be leaders who can conceptualize visions of the future and lead their organizations in new directions for change.

The most recent barrage of criticisms of American education is related to the highly prized value of professional autonomy. Etzioni (1964) considered the dilemma of heading a professional organization. Autonomy in educational organizations invites low interdependencies between organizational members, unclear or shifting goals, a lack of instructional technology, and the absence of effective performance appraisal procedures (Weick, 1982). All these cultural dynamics of American educational organizations produce a basic ambiguity in leadership life (Cohen, March, and Olsen, 1972).

The Problem

Studies indicate that a significant number of the experienced chief administrators will have departed by the beginning of the new century. Three generations of college presidents will have held office between 1980 and 2000--10,000 in total (Kerr and Gade, 1987). In the State of Michigan over one third of the superintendents are presently eligible for retirement (Department of Education report, 1987). Uncertainty, ambiguity, diversity, complexity, and paradox are conditions of both the external environment and

the nature of the internal structure of educational organizations. Individuals with a broad range of skills, aptitudes, and professional and life experiences must be in the roles of executive leadership.

STATEMENT OF PURPOSE

The purpose of this study was to initiate some brain dominance research of chief educational administrators to determine what personal and work elements are key in the present leadership, and what cognitive processes might be encouraged to promote a balance of technical, intuitive, and conceptual skills. It is hoped that results from this study might be used to recruit, select, and prepare future chief administrators, and to generate hypotheses for future research.

RESEARCH QUESTIONS

The over-all, guiding question in this study was to discover the brain dominance patterns of chief educational administrators from several types of educational institutions in the State of Michigan. The following research questions gave direction to the study:

1. Are there significant differences in the brain dominance patterns of educational chief administrators at identified institutional levels?

   a. Presidents of four-year higher education institutions
   b. Presidents of two-year higher education institutions
   c. Superintendents of K-12 school districts of 5000+ student populations
   d. Superintendents of K-12 school districts which are outside the state aid funding formula

e. Superintendents of intermediate school districts and the Superintendent of Public Instruction

2. Are there significant differences in the brain dominance patterns among chief administrators versus top level administrators with focused responsibilities?

a. Presidents of higher education institutions versus top administrators responsible for faculty and academic affairs

b. Presidents of higher education institutions versus top administrators responsible for finance and business affairs

c. Superintendents of school districts versus top administrators responsible for curriculum/instruction

d. Superintendents of school districts versus top administrators responsible for finance and business

3. Are there any significant differences in brain dominance patterns in terms of the following variables: 1) number of years of chief executive experience, 2) size of institution, and 3) type of community in which located (urban, small city, suburban, or rural)?

Answers to the above questions provided data to support or reject the research hypotheses.

RESEARCH PROCEDURES

Selection of the Study Population

The study population was selected from two groups which are assumed to represent educational leadership in the State of Michigan:

1. The primary study group was invited from chief educational administrators of public education institutions in the State of Michigan. The institutions included 15 4-year state colleges and universities, 29 2-year community

colleges, 57 intermediate school districts, 58 K-12 public school districts serving 5000+ student populations, 77 K-12 public school districts representing a variety of student populations, geographic locations, and community type, and the Superintendent of Public Instruction. A total of 237 chief educational administrators were invited to participate in the study.

2. The second group of top level administrators was selected from the institutions served by the chief administrators, (4 year colleges and universities, 2-year community colleges, and the K-12 public school districts serving 5000+ student population) and chosen for their technical/functional responsibilities in the organization (i.e. finances, curriculum, or academic affairs). It is assumed that this is the most ready pool of experienced candidates for chief administrative positions. One hundred ninety-two top level administrators were invited to participate in the study.

3. There are 10 women chief educational administrators in the State of Michigan--two are community college presidents. In addition to the other K-12 superintendents, the eight women were invited to participate.

The potential study group numbered 435 educational administrators.

Instrumentation Used

The Herrmann Brain Dominance Inventory is a paper-pencil, self-survey questionnaire containing 120 questions, each of which has a dominance "tilt" in one of four quadrants, representing the structure and specialized functions of the brain:

1) People whose thinking style preferences are primarily in the left cerebral quadrant enjoy analyzing complex situations and are intrigued by solving technical and mathematical problems. When confronted with a problem, they are more likely to employ logical cognition patterns than those with dominance in other quadrants.

2) People whose thinking style preferences are primarily in the left limbic quadrant focus on organizing the facts, planning and attending to details. They are skilled at implementing ideas and following through. These individuals approach problems in a step-by-step, controlled procedural manner.

3) Right limbic individuals enjoy the interpersonal aspects of their job. They are skilled at developing and expressing ideas and understanding the interpersonal climate of work groups and organizations. They approach problems in an intuitive manner, using feelings--a gut reaction--more than facts to make decisions.

4) Right cerebral individuals prefer conceptualizing, synthesizing, and creating new ideas. They are skilled at being innovative and seeing the big picture. When confronted

by a problem, they approach it in an experimental, intuitive manner. These individuals become frustrated with details and others who operate in a sequential, conservative, safe-keeping manner. (Coulson, 1983)

Although people tend to interpret, understand, and act on their environment in one or more of the quadrants listed above, every individual who is not brain damaged receives input from the environment in a whole-brained way. Each person who took the Herrmann Inventory, consequently, received a score in each of the four quadrants, providing a measurement of cognitive style preferences--a Whole Brain view.

Data Analysis

The scores from the Herrmann Inventory were summarized in five categories. The *Overall Dominance Scores* represent a balance between the left- and right-hemisphere processing, and the balance between cerebral and limbic processing. The *Profile Code* indicates the quadrant(s) which is preferred, that which is commonly used, and that which is avoided when possible. The *Dominance Scaled Scores* are derived from the raw scores for the four quadrants, multiplied by 1.5 in order to dramatize the degree of "tilt" in each quadrant. The *Key Descriptors* are eight adjectives chosen as self-perception indicators of what individuals believe best characterized them. The scores were analyzed for frequency, central tendancy and variability. ANOVAs and MANCOVAs tested the research hypotheses.

DEFINITION OF TERMS AND ABBREVIATIONS

An understanding of certain key terms is important to this study, particularly those related to brain dominance.

Analytic: The cognitive process of separating the whole into parts and examining them to understand their nature, and to see how they are related.

Brain dominance: The hemisphere of the brain, both cerebral and limbic, which has governance over behavior.

Cerebral: Referring to the outermost portion of the brain, the newest evolutionary development of the brain structure; the cerebral hemispheres, right and left, are most popularly thought of as processing "higher" cognitive thought.

Cognitive: Concerned with the perceiving and thinking mental processes.

Conceptual: The ability to conceive thoughts and ideas in the mind by developing abstract ideas generalized from specific instances.

Empathy: An ability to understand the feelings of another person, and communicate that understanding.

Interpersonal: Able to develop and maintain meaningful and pleasant relationships easily and with many different kinds of people; comfortable with human diversity.

Limbic: Referring to the portion of the brain structure that surrounds the brain stem, which is nestled below the two cerebral hemispheres, and which is responsible for perceiving the concrete world.

Mind: The mind is to the brain as digestion is to the stomach--the brain is what IS, and the mind is what the brain DOES.

Vision: The ability to discern through foresight and to formulate images of the future.

Abbreviations

HBDI is the abbreviation used for the *Herrmann Brain Dominance Inventory*.

LC is the abbreviation used for the left cerebral quadrant of the Brain Dominance Profile model, representing analytic mental processes.

RC is the abbreviation used for the right cerebral quadrant of the Brain Dominance Profile model, representing conceptual mental processes.

LL is the abbreviation used for the left limbic quadrant of the Brain Dominance Profile model, representing organizing, administrative mental processes.

RL is the abbreviation used for the right limbic quadrant of the Brain Dominance Profile model, representing interpersonal mental processes.

LIMITATIONS AND DELIMITATIONS

Limitations

This study will be limited to chief educational administrators in all public educational institution types (four) in the State of Michigan who volunteered to participate and who actually returned the completed instruments.

Selected top level administrators, in the State of Michigan, with functional/technical responsibilities which address the financial, instructional or curriculum needs of the educational organization will be studied because they represent the most ready pool of candidates for chief administrative positions. Voluntary participation will determine those selected for the study.

Delimitations

This study will not attempt to predict success of administrative leadership.

This study will not determine or evaluate the preparation and/or training of educational administrators.

This study will examine a relatively small sample because of the necessary one-to-one surveying procedures.

This study will not examine the sexual differences in brain dominance of chief educational administrators because of the small population of women in executive positions (10) in the State of Michigan.

BASIC ASSUMPTIONS

There are four basic assumptions related to this study:

1. The criterion group consisting of chief administrators in four levels of public educational institutions (i.e. higher education, including 4-year colleges/universities and 2-year community colleges, intermediate school districts, K-12 school districts, and the State

Department of Education) in the State of Michigan is representative of the universe of public education chief administrators.

2. Self-reports of personal characteristics and preferences are reflective of the actual functioning of participants and not overly influenced by "self-typing" of early ascriptions of family functioning.

3. Public educational systems in the State of Michigan will represent a complexity of structure, sub-units and financial resources, as well as diversity of constituency groups and program offerings.

4. The *Herrmann Brain Dominance Inventory* will continue in use as a tool for determining dominant cognitive style patterns in persons as related to their career choices.

SIGNIFICANCE OF THE STUDY

The results of this study may have a variety of uses:

1. The descriptive results may provide specific areas of focus for personal choices for professional development of practicing chief administrators and those top level administrators aspiring to the executive position.

2. The findings may have implications for the recruitment, selection and training of chief educational administrators.

3. The descriptive results of this study could assist in selecting advanced-degree candidates for educational administration programs, and in guiding individuals into the most appropriate course of study within the administrative field.

4. Since the study explores the analytical, interpersonal, and conceptual aspects of management and leadership, it could influence the content and design of future educational administration training programs.

OVERVIEW OF THE STUDY

The study will be presented in five chapters. Chapter I will include an introduction; the rationale and a statement of the problem; a statement of the purpose for the study; the research questions and procedures; definition of terms; the limitations and basic assumptions; a statement of the significance of the study; and an overview of its organization.

A review of selected literature and research on identified mental processes of chief executives, leader and manager behaviors, the organizational dynamics of educational institutions, and brain dominance technology will be presented in Chapter II.

Chapter III will present the methodology of the study.

Chapter IV will present and analyze the data collected for this study.

Chapter V, the concluding chapter, will include a listing of findings, a summary, a discussion of the implications of the study, conclusions, and recommendations based on the findings of the study.

CHAPTER II

REVIEW OF SELECTED LITERATURE

INTRODUCTION

Educational institutions have been responding to decreases in traditional student populations, to increases in student diversity and complexities of constituent groups, to fast-developing technology with increased demands for changes in instructional methodology and for measurable results, and to reductions in and a shifting of financial resources. Change is a major element in the dynamics of educational organizations in the 1980's. Chief educational administrators are the managers of the complexity, ambiguity, and paradoxes inherent in these changes.

Current management and leadership studies are articulating the need for creative responses to change. The concept of Executive Mind has recently become a field of inquiry to explore what, why, and how executives think, feel, and act (Srivastva et al, 1983). The executive in action provides a particularly suitable focus for exploration of the rational and the non-rational, of the systematic and the intuitive, and how these dichotomies merge into a patterned whole as the executive goes about his or her business (Torbert, 1983).

One of the outcomes from the prolific brain research of the past thirty years is that as scientists have examined how the brain functions, they have enabled organizational researchers to gain a greater understanding of how human

brains "filter" reality, and shape not only individual perceptions but also personal and institutional values (Schein, 1985b). This chapter will first present current brain research as it provides the foundations for executive thought; several key concepts of administrator effectiveness will be considered from the viewpoint of mental processing and resulting behaviors; views on the unique environments of educational organizations will be examined; and parallel studies of brain dominance as they relate to the work of chief executives will be reviewed.

BRAIN RESEARCH

A brief overview of the progress in brain research is intended to present both the breadth and depth of considerable brain research as it provides the foundations for executive thought; several key concepts of administrator effectiveness will be considered from the view point of specific brain structures, their characteristics and functions; attention will be given to the importance of specialized mental processing, beyond the popularized notion of right- and left-brains. As each of the research areas are outlined, connections will be made with some of the new insights into managerial thought and action.

The Neuron--The Beginning of Structure

The human brain weighs approximately three pounds, and is comprised of 100 to 200 billion separate, well-defined *neurons* communicating with one another at trillions of

synaptic points. In 1906 Spanish neuroscientist, Ramon y Cajal, compiled massive evidence to show that the incredibly complex interconnections among neurons were *not* random, but rather highly structured and specific in their processing, and intended for the storage of sensory data and perceived information (Hubel, 1979, p. 5).

The multiplicity of neurons and their synapses are surrounded by ten times as many *glial* cells, the "glue" that holds the brain together. With increased use these cells also create a special coating, called *myelin*, which insulates the connecting fibers that carry electric signals/information between nerve cells at a much faster and more efficient rate. By increasing the number of glial cells in the brain through sensory-enriched environments, the speed of learning and information processing is accelerated. It is the neural activity of the brain which produces the multiple levels of consciousness known as the human mind. (Restak, 1984, pp. 27-49)

As adults deliberately take their minds into new areas, they do more than just add to their stores of information. Even as the content of mind is enlarged, the context is also altered. The working through of new intellectual and creative challenges, particularly in a depressurized setting, is believed to change the chemical structure of the neurons involved and thereby strengthen the cell bodies. Information can then be processed more quickly and accommodate more

power, thus making more complex neural networks. The executive mind is constantly faced with both intellectual and creative challenges--often in pressurized settings.

Executives are constantly learning and integrating the dynamics of the organization. Kolb (1984) proposes a model for problem management which is derived from a single, holistic, and adaptive process of learning through experience: the dialectic movement from *situation analysis (valuing and priority setting),* to *problem analysis (information gathering and problem definition),* to *solution analysis (idea getting and decision making), and* finally *implementation analysis (participation and planning).* Kolb's model is intended to utilize both the logical, rational mental processes in equal balance with reflection and abstract conceptualization--an interactive process congruent with the neural structure of the brain.

The Triune Brain--Evolution of Structure

At the Laboratory of Brain Evolution and Behavior of the U.S. National Institute of Mental Health Dr. Paul MacLean has worked for nearly thirty years to understand the programming of two ancient brain systems he believes to be buried in the interior of our skulls. MacLean's Triune Brain Theory (1973) provides an evolutionary view of human brain development, and an underpinning for an intuitive understanding of the powerful influence that irrational forces appear to have in shaping human behavior and lives.

The brain as explained by MacLean is an integration center for the nervous system. The vast majority of creatures do not have any brains at all in this sense; their various subsystems are not unified in a "head office". The size and complexity of an animal's brain tends to be directly related to that species' survival needs. Humans have no standard way of living. We have a variety of responses to our external worlds; we are extremely adaptable and dependent on a great number of behaviors. Humans have developed means of survival and a way of living that demands a stupendously large brain. (See Figure 1)

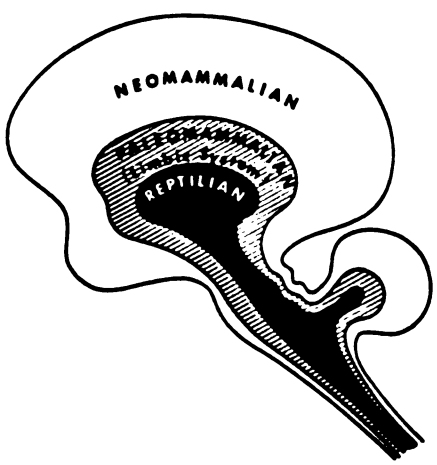


Figure 1: The Triune Brain

SOURCE: Paul D. Mac Lean, A Triune Concept of the Brain and Behaviour (Toronto: University of Toronto Press, 1973), p. 9.

MacLean's view of the human brain is somewhat like an archaeological site, with the outer layer composed of the most recent brain structure, the *cerebral cortex*, or "new mammalian brain", the most highly developed in humans. It can look into the future and anticipate the consequences of

actions. The cerebral cortex furnishes us with our most human qualities: language, ability to reason, ability to deal with symbols, and ability to develop a culture. This newest brain is described as being responsible for the non-emotional analysis of the external environment--it operates unhindered by signals and noise generated in the internal world. It is thought to have a predilection for dividing things into smaller and smaller units, to perform abstractions, and to allow the development of reading, writing, and arithmetic.

The "old mammalian brain", better known as the *limbic brain*, is shared with all other mammals. It deals with the emotional feelings that guide behavior and the recording of memories. Though this brain has no verbal language to express logical certainty, it does seem to have "the capacity to generate strong affective feelings of conviction that we attach to our beliefs, regardless of whether they are true or false" (MacLean, 1975, p. 218). MacLean noted that memory, just as a feeling of personal identity, depends on the brain's ability to combine internal and external experiences. "The condition that makes us unique as individuals is this private, combined form of experience" (MacLean, 1978, p. 331).

The R-Complex, or Reptilian brain, is the oldest and deepest buried of the three human brains, completely enclosed by the limbic system. This brain includes the upper

brainstem--a complex structure where the neural mechanisms are responsible for behavior involved with safe-keeping and maintaining the status quo:

> The reptilian brain is filled with ancestral lore and ancestral memories and is faithful in doing what its ancestors say, but it is not a very good brain for facing up to new situations. It is as though it were neuroses bound to an ancestral ego. (1978, p. 277)

MacLean postulates that such human characteristics as ritualism, awe for authority, social pecking orders, and comfort levels developed in "personal territory", may be partially caused by the reptilian brain.

The understanding of the human brain which MacLean has brought more clearly into view is that as a whole, it is *not harmonious*, but works through a precarious, constantly changing balance of these three "partners". There has been increased research into the significance of the limbic system in recent years. Studies are inconclusive as to specific functions of each of its parts, but like the cerebral hemispheres it has duality of structure--right and left sides. In the brain dominance model (Herrmann,1985), the left limbic system is identified as the center for planning and organizing activities. It influences the degree of structure and control that colors one's thinking and is itself greatly influenced by the safe-keeping aspect of the R-Complex.

The right limbic system *governs* a broad spectrum of intense emotional feelings: fear - rage, fight - flight, relaxation - tension, pleasure - pain, expectation-actuality, stability - instability, participation - warding off, and sociability - self-asserting. (A.T.W. Simeons, 1961, p. 32) It is certain that the major nerve routes between the body's perceptual and movement systems and the highest brain mechanisms in the neo-cortex travel through the limbic system (Nauta, 1979, pp. 40-53).

It is to this limbic brain that humans "downshift" when threatened by intense peril or high stress (Hart, 1983, pp. 108-111). It has "a greater capacity than the reptilian brain for learning new approaches and solutions to problems on the basis of new experience" (MacLean, 1978, p. 278), but generally it keys quickly on what it senses is happening in the outside world, and it does not do more thinking--it just reacts to avoid "pain" and to heighten "pleasure" and it does not have the ability "to put its feelings into words" (p. 278).

MacLean's final conclusions emphasize that the way each person "sees" reality depends largely on the *holistic* functioning of the brain, the ancient and the newer parts alike.

The Forebrain--Interconnections

In the early 1970's Walle Nauta discovered that the vast interconnecting nerve pathways from the frontal lobes of the cerebral hemispheres had two major destinations--one straight

into the center of the limbic brain and one to the sensory input areas of the cerebral cortex (197, p. 181). Researchers now believe that the frontal lobes are in the "driver's seat"--they can and do trigger key choices in human perceptions and behaviors. This is the structure of the brain where it is believed the human value system is refined and given meaning (Pugh, 1977, p. 152).

When this aspect of the human neural equipment is "exercised", it strengthens the centers believed to be largely responsible for our abilities to see patterns of change; to extrapolate from present trends to future possibilities; to self-regulate bodily processes through insight, internal commands and generation of visual images; to form highly complex threads of creativity and analysis using formal logic and metaphor; and to produce the rational and emotional foundations for altruism and social interaction (Lynch, 1984, p. 117).

Specialization of the Hemispheres--Functions

Bicameral, duality, split-brain, asymmetry, and hemisphericity are all terms applied to the prodigious research relating to the two cerebral hemispheres of the brain. Many of the studies of brain duality have served to divide researchers, psychologists, philosophers, and educators into two camps--the pro and con interpretations and extrapolations of the implications of the functions of the

"two brains", and the attempts to propose the "correct" understanding of the practical application of the growing and changing views of "brainedness".

In the mid-nineteenth century, researchers began to identify specialized functions in identified areas of the brain. Broca's (1861) area, located in the left frontal lobe, is primarily concerned with language production, while Wernicke's (1874) area is concerned with semantic/meaning aspects of language, and is located in the left temporal lobe. It was the evidence of language being resident in the left hemisphere that began to give rise to the belief that this was the "primary" brain (Geschwind, 1977).

In 1978 Ruben Gur, using the computerized technology of the PET scan and radioactive glucose, demonstrated that wide areas of the brain, certainly not limited to the left hemisphere, were involved in the processing of language. The visual and auditory areas may become involved because of visual or verbal associations. Memory, which is involved with structures of the brain in the limbic system, must also be needed for language ability (Gur et al, 1982).

The whole brain is able to function in concert through the *corpus callosum* (200 million nerve fibers--more nerve connections than all of the remaining nerve structures running from the brain to the rest of the body) which serves as an instantaneous communication network between the two cerebral hemispheres. In early experiments severing the corpus callosum of cats, Roger Sperry was able to infer that

each half of the brain was capable of functioning independently. Sperry, with associates Levy (1968, pp. 151-155) and Gazzaniga (1970) were able to study in laboratory settings the split brain patients of neurosurgeons Vogel and Bogen (1969, pp. 73-105) to determine the specialized abilities housed in each hemisphere, and how the two hemispheres interact. (See Figure 2)

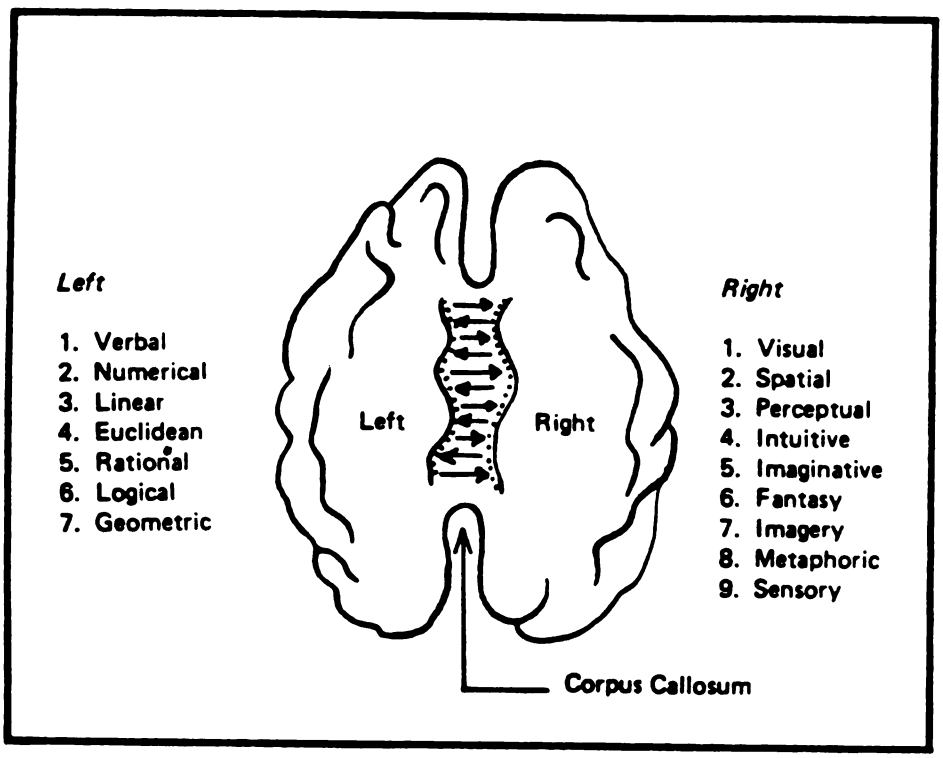


Figure 2: Specific Functions of Left and Right Hemispheres.

SOURCE: Max R. Rennels, "Cerebral Symmetry: An Urgent Concern for Education," Phi Delta Kappan, March 1976, 57, (7) 471-472.

Ornstein conducted EEG studies of intact-brain subjects in order to determine how well each hemisphere performs relative to the other on specific tasks--that is, the relative abilities of each hemisphere (1972, pp. 92-108).

As each of the hemispheres gathers in the same sensory information, each half of the brain may handle the information in different ways:

LEFT HEMISPHERE

In the majority of persons, the left hemisphere specializes in language (Gazzaniga, 1967; Kimura, 1973; Nebes, 1974). This hemisphere finds its strengths in analytic reasoning, logic, long-term memory, sequential and mathematical mental processes (Bogen, 1973; Dumas, 1975; Luria, 1970, Baddeley, 1982), in controlled emotion (Sperry, 1975); and in the control of linear time (Ornstein, 1972).

RIGHT HEMISPHERE

The right hemisphere tends to be non-verbal (Gazzaniga, 1983), though it has been able to take over language function in some aphasic patients (Zaidel, 1983). It demonstrates a superiority in spatial tasks and visual processes (Kimura, 1973; Kinsbourn and Smith, 1974; Gazzaniga and LeDoux, 1978, Levy, 1969), and facial recognition (Jaynes, 1976). Artistic ability (Edwards, 1979; 1986) and musical skills (Bogen and Gordon, 1971) were identified as strengths of right hemisphere processing. Metaphorical (Samples, 1976) and divergent thinking processes (Austin, 1971) are combined with the left hemisphere language to produce creative and persuasive

ideas. Intuition, a function of the right hemisphere, is a highly efficient way of knowing without using prior knowledge or reason. The intuition is fast and accurate, processing a wide array of information on many levels, and giving instantaneous cues about how to act (Agor, 1984).

The emotional aspects of this hemisphere place the expression of emotion and feelings, the inference of others' feelings and motivations, and a sense of humor as a high priority. Integrating information and making inferences from that synthesis, especially when dealing with visual or nonverbal material are processes which often happen unconsciously, but can be brought to consciousness and utilized with intentionality (Lynch, 1984, p. 29).

Whole Brain--Optimal Use of Structure and Function

The early work of Gazzaniga and Ornstein served a useful purpose for helping a wider population begin to gain increased understanding of brain function, though it is too simple a framework. The human brain does not break down into neat categories. Its performance can often best be understood as "a choice of what is most favorable under the circumstances" (Restak, 1984, p. 248). PET scan studies have demonstrated that the same activity may be carried out by different brains according to past experiences and present goals (Mazziotta, 1983). The metabolic mapping of individuals is providing a new dimension to the old truth: "People may not only be of a

`different mind' on issues, but they may also use different parts of their brains to do the same thing" (Restak, 1984, p. 250).

Brain Dominance--The Proper Fit

In 1868 John Hughlings Jackson proposed the idea of the "leading" hemisphere, following the discovery of Broca's language area: "The two brains cannot be mere duplicates if damage to one alone can make a man speechless. For this process, of which there is none higher, there must surely be one side which is leading" (in Springer and Deutsch, 1981, p. 12). Later studies demonstrated that there were shifts in dominance aided by the presence of the corpus callosum when various tasks were presented to the brain's sensory fields--shifts from "task to task, subject to subject, and trial to trial" (Cohen, 1979, p. 309). Wilkins and Stewart (1974) suggest that the brain directs the task, content, or work toward the style-appropriate hemisphere.

Dominance can be seen more concretely in the choice of a dominant hand, foot, or eye; seldom are both sides used equally well. Another demonstration of cerebral dominance might be found in a couple assembling a toy on Christmas Eve--one reads the instructions step-by-step, the other prefers to lay out all the parts, look at a picture of the assembled toy and proceed. It is clear that it is important for each hemisphere to do the mental task for which it is best suited. There is, however, a tendency for an individual to develop a style of cognitive processing in which one

hemisphere usually is dominant; he relies too heavily on the dominant mode, even when it is inappropriate to the task at hand (Levy, 1976).

Herrmann has developed a metaphorical model of brain dominance which has four quadrants reflecting the preferred modes of knowing, correlated directly with the specific kinds of work that persons chose as central in their lives. Research focused on professionals in specific occupations reveals that "people gravitate towards work that allows them to use their preferred modes of knowing in ways that contribute to their success and fulfillment" (Herrmann, 1986, p. 20) Data exhibiting comparable brain dominance profiles have been collected in 784 occupational groups.

An individual's mental preferences influence not only the work they do, but the way in which the work is carried out. Typically, an individual will be able to attain higher competence on the job if there is a good match between mental preference and the work elements required to do the job. Under these conditions, competence is achieved faster, more easily, and at a higher level than when there is a mismatch (Herrmann, 1986, p. 20). In the Herrmann studies, dominance is not a simple either/or situation. Data indicates that most individuals have multiple dominance: 30% are single dominant; 40%, double; 25%, triple; and 5% are dominant in all four quadrants, or "whole brained" (Herrmann, 1985).

Clarification

There has been much discussion about which is primary--the brain or the mind. For the purposes of this study, this researcher accepts the premise that the brain is the tool of the mind--the brain is the physical structure which activates and facilitates the mental processes which represent the workings of the human mind. In discussions which utilize the concept of "mind", there will be an attempt to ground the phenomena in structures and functions of the human brain.

ADMINISTRATOR EFFECTIVENESS

In 1936 Barnard articulated the differences between non-logical and logical mental processes as they applied to common vocations, especially executive functioning:

> It should go without saying that both kinds together are much better than either alone if the conditions permit; but when this is not possible, good sense would suggest that if there are various processes available for doing work, one should be selected that is best adapted to it. It seems that this does not occur with sufficient frequency and that it takes a good deal of judgment and experience to do it well.
>
> (1938, pp. 306-7)

Barnard was the early proponent of both effectiveness and efficiency in managing organizations, emphasizing the use of appropriate mental processes. Hersey and Blanchard's Situational Leadership concept (1982) is focused on increasing the manager's effectiveness for developing the "influence potential of followers" by examining the relationship between three primary factors: 1) the amount of direction

and control (Directive Behavior) a leader gives; 2) the amount of support and encouragement (Supportive Behavior) a leader provides; and 3) the competence and commitment (Development Level) that a follower exhibits in performing a specific task (Blanchard, 1985). There is no one best style of leadership. Managers must assess the task to be accomplished and the development level of the followers, then choose the appropriate leadership style. "Directing" and "Coaching" styles incorporate more left hemisphere processes, while "Supporting" and "Delegating" utilize more of the right.

Managers or Leaders?

In "Managers and Leaders: Are They Different?" (1977) Zaleznik contrasted leaders and managers both in light of their behavior within their organizations and in terms of their personality, needs, and attitudes as observed during clinical studies.

Zaleznik argues that leaders see goals as more personal, action-oriented opportunities. They prefer to articulate ideas about work in terms of images that excite people, and to develop options for how the work can get done. He characterized leaders as essentially loners--relating with others more intuitively and empathicly than personally; their empathy enables them to understand what different events mean to different individuals. They are risk takers and visionaries who accept the challenge of changing conditions.

Zaleznik's view of managers depicts them as committed to enabling others to accomplish tasks by coordinating and balancing the structure of work. They negotiate and bargain, and make flexible use of rewards and punishments. They see goals as more impersonal--a given--reacting to them in a passive, accepting manner. Managers prefer to work with people, by relating to them according to roles and task accomplishment.

Studying social history, Burns (1978) focused his research on two kinds of leadership: transformational and transactional. The transformational leaders (Zaleznik's leader) identify personally with the mission of the institution, are perceived by followers as solitary, inspirational figures who can engender intense emotions in organizational members. In addition, the transformational leaders have stronger empathy skills than the average person, enabling them to identify needs of organizational members even when members are not consciously aware of them, thereby being able to accurately assess and provide a mission and goals that, when achieved, respond to the followers' needs. Transformational behaviors reflect more of the emotional, synthesizing and wholistic mental processes.

The transactional leaders (Zaleznik's manager) view the leader-follower relationship as a process of exchange: rewards for work done, jobs for votes, favor for favor. They are focused on the task at hand, mobilizing people to accomplish the task, making short-range plans which provide for

conformity, stability, and smooth, steady relationships. The transactional behaviors are grounded in the factual, organizing, and analytic mental processes.

Transformational leaders never leave matters as they find them--they usually have a clear change objective, some particular end state in mind. Burns contends that most leaders today are transactional, responding to the bureaucratic nature of most organizations as well as the culture which evolves:

> An organization is a system, with a logic of its own, and all the weight of tradition and inertia. The deck is stacked in favor of the tried and proven way of doing things and against the taking of risks and striking out in new directions.
>
> (Rockerfeller, 1973, p. 72)

Wortman (1982) focused his studies on operating and strategic managers in corporations. His thesis is that top managers--executives--think and act strategically (long range), whereas managers further down in the corporate structure must be concerned with daily operations. According to Wortman, executives (leaders), as opposed to managers, exercise strategic management not only via the more obvious dimensions of analysis, policy formulation, evaluation, and planning, but also in their personal behavior. Executive leaders must be more charismatic, inspiring, and flexible. They must have the skills to inspire followers to accept change, to take initiative and risks. Wortman implies

that *there may be basic differences in personal characteristics between those who rise to executive leader status and those who remain in the management ranks.*

Stimulated by Getzels and Guba's (1957) model of organizations, Abbott (1960) developed a concept of "selective interpersonal perception" for understanding administrative relationships. In essence the concept supports the conclusion that each person may be said to function in a world of his own making--his attitudes and values serve as a perceptual screen; he interprets his environment according to the way he perceives it; and he reacts to that environment in accordance with his interpretations.

McKinney and Keen (1974) created a model of managerial cognitive style for the purpose of calling into question the popular assumption that there is one "right" way of solving problems. As these two researchers developed their model, they precisely chose the term "style" rather than "structure" in order to stress their belief that modes of thinking relate more to *propensity than to capacity:*

> An individual's style develops out of his experience.... This suggests not only that tasks exist that are suited to particular cognitive styles, but also that the capable individual will *search out* those tasks that are compatible with his cognitive propensities. In addition, he will generally approach tasks and problems using his most comfortable mode of thinking. (1974, pp. 82-83)

In the area of decision-making, Wilmotte, Morgan and Baker (1984) argue that organizations can take advantage of the diverse ways in which people reason by creating

administrative teams which reflect specialized information-processing abilities of the brain. Agor (1985) has observed that most organizations assemble teams to solve problems based on the criteria of who is responsible for the area in question or who has worked for the organization a given number of years. He suggests that a potentially more productive way to solve a problem would be to assign personnel on the basis of brain skills.

Bass reports in Leadership and Performance Beyond Expectations (1985) on his empirical research which is intended to support the study and understanding of transformational and transactional leadership. He contends that transformational leadership is not a rare phenomenon limited to a few world-class leaders. Rather, it is to be found in varying degrees in all walks of life; in fact, while conceptually distinct, Bass believes that transactional and transformational leadership are likely to be *displayed by the same individuals in different amounts and intensities*. Bass proposes that once we have broadened the scientific evidence to support the existence and importance of the transactional/transformational leadership characteristics, then we must turn our attention to determining how to "identify and encourage its appearance in the military, in business and industry, and in educational and governmental agencies" (Bass, 1985, p. xv).

Professional Development

Katz (1974) proposed in 1955 that "technical," "human" and "conceptual" skills were keys to administrator effectiveness. *Technical skill*, according to Katz, assumes "an understanding of and proficiency in the methods, processes, procedures, and techniques" of educational institutions (p. 91). In non-instructional areas it also includes specific knowledge in finance, accounting, scheduling, purchasing, construction, and maintenance. *Human skill* refers to the executive's ability to work effectively and efficiently with other people on a one-to-one basis and in group settings. This skill requires "considerable self-understanding and acceptance as well as appreciation, empathy, and consideration for others" (p. 91). Its knowledge base includes an understanding of and facility for adult motivation, attitudinal development, group dynamics, human need, morale, and the development of human resources. *Conceptual skill* includes the executive's ability to see the organization, the community in which it is situated, and the political, social and economic forces as they interact and impact the whole (p. 93).

Twenty years of working with senior executives in a wide variety of industries convinced Katz of the importance of human and conceptual skills which were not being emphasized in professional development programs. He submits that *intragroup* skills are essential in lower and middle management roles, and that *intergroup* skills--facilitating

cooperation and consensus between departments, or competing groups--is increasingly important in successively higher levels of management. Wortman (1982) foresees a shift in leadership style for executives: 1) They will need to be more participative with their boards because those members will have more and more influence on the analysis and formulation of organizational goals and on the monitoring of executive performance; and 2) in large organizations executives will have more of a peer relationship with top level managers/administrators and will need a more collegial style. The key factor for the executive in these new relationships will be "having trust and being trusted" (p. 379).

Zaleznik (1964), Mintzberg (1974), and Fry and Pasmore (1983) urge more understanding of the interpersonal relations of managers and their effects on the functioning of the organization. In research on leadership dimensions and cognitive style, Weissenberg and Gruenfeld (1966) expressed the concern that in public service institutions, persons are promoted to management positions based on achievement tests. Their research indicated that these individuals tended to shun interpersonal aspects of leadership behavior and "may be poorly motivated to make distinctions among the performances of group members" (p. 394).

Katz (1974) argued that it was crucial for executives to develop their conceptual skills to the degree that it became a *natural* part of the executive's makeup--visualizing

educational "enterprise as a whole and coordinating and integrating its various parts" (p. 100). The "general management point of view" involves always thinking in terms of relative emphases and priorities among conflicting objectives and criteria, relative tendencies and probabilities (rather than certainties), rough correlations and patterns among elements (rather than clear-cut cause-and-effect relationships) (p. 101). He senses that conceptual skill of this type may be an innate ability; if not, he encourages those who aspire to executive positions to learn this more holistic approach early in their careers.

In studies of 90 effective leaders, including chief executive officers, university presidents, politicians, coaches, and newspaper publishers, Bennis and Nanus (1985) found that the general common denominator in effective leaders was the ability to provide a vision--a focus for people's energies to accomplish the organizational goal. Peters and Waterman (1982) report the nature and uses of communication used by leaders who "manage by walking around" (p. 121). Barnard (1938) claimed that the three essential functions of the executive were 1) "to provide the system of communication, 2) to promote the securing of essential efforts; and 3) to formulate and define purpose" (p. 217). Conceptualizing is the key to effective executive functioning.

Establishing common goals is not only a matter of communication, but more importantly an issue of power. The rise of participative management practices indicates a need to empower organizational members. After discussing the bases of power and utilizing the theory of power needs (McClelland, 1975), Burke (1986) suggests that organizational leaders must have moved beyond the "need to have impact on others" to " the desire to influence and empower others to achieve" (p. 56). Burke's research demonstrates that the leader, as opposed to the manager, is one who is sensitive to the system. By being in tune with the group's desires and by conceptualizing and envisioning these desires, the leader empowers (p. 72).

In observing executives on the job, Mintzberg (1975) noted that individuals tended to gravitate toward their mental dominance; the analytic left-brained types usually ended up in staff positions, whereas high-level managers tended to be right-brained, intuitive types who depended on non-verbal interpersonal cues, "hunches", strategy formation, and the synthesizing of large amounts of information.

Today's executive decision-makers live intensely and have more obligations and problems than they have time. For them the highest need is to cut through the complexities of the modern world and come to quick creative decisions intuitively. Taggart (1981), Agor (1984), Lynch (1984), and Rowan (1986) urge managers to develop trust in their intuitive abilities and to follow good "hunches". The timing factor of

intuitive decision-making was observed in the research of Giannini et al (1978). As the communication channel is kept open between the two hemispheres, executives may enjoy the benefits of a wider spectrum of possibility, of potentiality, and of mental maneuverability.

From his research on the dynamics of career development in organizational chief executives, Edgar Schein (1985) developed a group of eight "Career Anchors". Everyone differs in how they view their careers and working life; each person has a degree of each of the anchoring patterns, but one is more dominant than the rest. Schein created a career development instrument through which individuals could inform themselves more specifically of their own personal needs, motives, values, and experiences that could facilitate career development.

In Schein's Career Anchor concept, the Managerial Competence career anchor is preferred by persons who combine the fullest range of cognitive processes--in other words, is "whole brained". Three areas of competence are identified which are necessary for the general manager whose goal is to become the chief executive of an organization:

> 1) Analytical Competence is the ability, under great time pressure, to take incomplete information of unknown validity and convert that information into a clear problem statement that can be worked on. These persons can identify, analyze, synthesize and state problems in such a way that decisions can be made. The ability to think *cross-functionally and integratively* gives these individuals the skills to manage the process of decision-making in the organization as a whole.

2) Interpersonal and Intergroup Competence: As much of the technical information that goes into decision making will increasingly be in the heads of subordinates and peers as organizational tasks become more complex, so the quality of decisions will increasingly hinge on the ability of general managers to bring the right people together around the right problems, and then to create an interpersonal problem-solving climate that will elicit full exchange of information and full commitment from participants. Executives quickly learn that the complexity of organizational tasks is such that they simply cannot any longer make decisions by themselves. They are highly dependent on the information and insight of others and must find ways of eliciting and utilizing the involvement of those others. As in transformational leadership, the ability to influence, supervise, lead, manipulate, and control people at all levels of the organization *toward organizational goal achievement* is a pivotal dimension of the Managerial Career Anchor.

3) Emotional Competence is the capacity to be stimulated by emotional and interpersonal issues and crises rather than exhausted or debilitated by them; the capacity to bear high levels of responsibility without becoming paralyzed; and the ability to exercise power and make difficult decisions without experiencing guilt or shame. Schein believes that it is the essence of the executive's job to absorb the emotional strains of uncertainty, interpersonal conflict, and responsibility. In his research, he has found that it is this aspect of the job that managerially-anchored persons increasingly seek, that excites them, that makes their jobs meaningful and rewarding (Schein, 1985, pp. 42-44).

Another career anchor which applies to some top management level persons is Technical/Functional Competence (Schein, 1985, pp. 40-42). This career anchor attracts persons who build their sense of identity around the *content* of their work, the technical or functional area in which they are succeeding. They prefer to develop increasing skill in their area of expertise; they want to be specialists. Some

technically or functionally anchored people have sufficient managerial talent to function at senior levels, but they clearly prefer the content of their work to the management of people.

Educational Institutions

Selznick (1957) defined an institution as a "nearly natural product of social needs and pressures--a responsive, adaptive organism.... Organizations become institutions as they are infused with values... The infusion produces a distinct identity" (pp. 5-6).

Sergiovanni (1980) argues that executive administrators of educational institutions must accept the very real multi-faceted existence of values in the administrative process and the need for "value-ordering". Over the past two decades there has been a growing gap between what schools purport to teach concerning values and how the school and its agents behave. "Administrative effectiveness for school executives depends upon the continuous examination of internalized value assumptions. ...Value conflict, for example, is treated at the interpersonal level and on a one-to-one basis rather than at the organizational level. Yet the major value problems ....are at the organizational level" (p. 29).

Karl Weick, in his "Administering Education in Loosely Coupled Schools" (1982), points out that the dimensions of leadership in educational institutions are markedly different

because of the basic assumptions and belief system operating in the organizational culture. Schein (1985) defines culture as

> the deeper level of *basic assumptions* and *beliefs* that are shared by members of an organization, that operate unconsciously, and that define in a basic 'taken-for-granted' fashion an organization's view of itself and its environment. These assumptions and beliefs are *learned* responses to a group's problems of *survival* in its external environment and its problems of *internal integration*. (1985, p. 6)

Researchers in organizational behavior (Cohen, March and Olsen, 1972; Weick, 1982) point out that educational administrators have been trying to apply conventional management practices to their institutions, assuming that they are like most other bureaucratic organizations. A major cultural value in our American experience is individual autonomy. In colleges and universities this autonomy takes the form of "academic freedom", while in public schools it is in the regard for the professional status of the teacher in the classroom. There is low interdependence among the teaching professionals at all levels of education--a very weak network for the dissemination and coordination of information, and little structure for formal or informal feedback on the effectiveness of efforts (Weick, 1982, p. 675).

Contemporary studies of educational effectiveness are demanding more intentional actions and observable results (Muschel, 1979; Edmonds, 1982; Chickering, 1981): unclear goals, a lack of instructional technology, and the absence of effective performance appraisal procedures produce a basic

ambiguity of leadership life in American educational organizations unlike most other bureaucratic organizations (Weick, 1983). Environmental conditions facing educational leaders are unprecedented according to Culbertson (1976): the long history of growth in schools has ended; the resources available for education are more limited; and concomitantly, there is a loss of confidence and a growing skepticism among citizens about education and its benefits.

Ambiguous structure and adverse times offer unique leadership opportunities to those who have a propensity for the work. These dynamics operate at the cultural level of educational organizations--they are basic assumptions and beliefs which are taken for granted and have dropped out of awareness in the daily operations of the institutions.

Schein encourages executive leaders to see themselves as managers of the organizational culture:

> ...Culture determines not only the ways in which the internal system of authority, communication, and work is organized and managed but also the organization's most basic sense of mission and goals.... Culture controls the manager more than the manager controls culture, through the automatic filters that bias the manager's perceptions, thoughts, and feelings. As culture arises and gains strength, it becomes pervasive and influences *everything* the manager does, even his own thinking and feeling.... (Organizational Culture and Leadership, 1985, p. 314)

Zaleznik (1977) believes that there are two different courses of development for those who are responsible for organizations: 1) the development through socialization, which prepares the individual to guide institutions and to

maintain the existing balance of social relations; and 2) the development through personal mastery, which impels an individual to struggle for psychological and social change. "Society produces its managerial talent through the first line of development, while through the second leaders emerge" (p. 75).

PARALLEL STUDIES

Herrmann (1985) has collected brain dominance data over the past eight years which demonstrates that the successful chief executives in business and industry are typically whole-brained in their dominance patterns--they access the analytical, integrative, organizational, and interpersonal components of their mental processes in appropriate situations.

Two brain dominance studies (Coulson and Strickland, 1983; Norris, 1984) have focused on educational administrators; both studies included school superintendents, neither has studied the administrative leadership in institutions of higher education.

Coulson and Strickland (1983) compared the thinking style preferences of two related occupational groups--school superintendents and corporate chief executive officers (CEOs). Several similarities were observed in these two groups: "both headed sizeable organizations; both established goals, influenced policies, and determined the direction taken by their organizations; both were called upon to solve

difficult problems, the resolution of which determined the growth or deterioration of their organizations (1983, p. 22)." By administering the Herrmann Brain Dominance Survey--the instrument to be utilized in this study--superintendents demonstrated more preference for left-mode thinking, while CEOs by comparison utilized more right-mode thinking. As reasoners and analyzers, superintendents were more rational, cognitive, quantitative, controlled, structured and conservative. CEOs--innovators and experimenters--tended to be more emotional, expressive, personal, and creative than superintendents.

In her doctoral dissertation (1984), Cynthia Norris studied educational administrators, including superintendents, principals, and supervisors--top and middle management levels. The nomination process was based on the three administrative skills described by Katz (1974): human, conceptual and technical. Superintendents in this study, which also utilized the Herrmann Survey, were characterized by a brain dominance style which was analytical. In the nomination process, this group was ranked as highly technical and less adept in the processes of conceptualization. Principals in this study exhibited a better balance between the analytical (left-brain) and conceptual (right brain) modes of thought than the superintendents. The "combined qualities suggest that they have the potential for conceptualization as well as the skills to insure that the implementation of ideas takes place" (Norris, 1984, p. 228).

Coulson (May 1986) has stated that the brain dominance data which has been collected to date on school superintendents is almost without exception left dominant, with the greatest preference being that which processes organization, planning, and controlling. Superintendents indicated that their least preferred mode was the one dealing with emotions, interpersonal relationships, and expressive skills--the very strengths of the transformational, influencing leader.

Summary

Brain research of the past three decades has demonstrated the immense capacity for human mental processing, the inter-connectedness and interdependence of the brain structures, and the natural proclivity for specialized responses to appropriate situations.

Recent management and leadership studies indicate that emphasis in management/administration training programs over the past few decades has been placed on the transactional, safe-keeping aspects of running organizations. Both the external and the internal environments of most human organizations today are experiencing rapid changes which require risk-taking, conceptualizing, and intergroup skills that will empower persons in these organizations to re-evaluate the nature of their work, and its responsiveness to a world that is entering a new century of human accomplishments.

Recently there have been many management books flooding the shelves claiming the need to utilize more of the right brain processes. Many imply that right is better than left.

Brain dominance technology demonstrates that whole brain is best for persons who choose to manage change, ambiguity, complexity, and paradox in their organizations. It is no longer appropriate to think of management/leadership in "either/or", "yes, but" elements:

> ....the indispensable quality of executive leadership--the get-it-all-together function in complex systems--is breadth. But a person who is willing without embarrassment to be styled a generalist is constantly impressed with the importance of *somebody* getting to the bottom of specialized questions. To focus on the generalist role is emphatically not to say that specialization and disciplinary expertness are passe'. A world of coordinators would be as much of a mess as a world of specialists. The need is to stir them together in the stew of social theory and action, which means that both kinds of people have to learn to live with each other in a symbiosis of mutual respect and mutual dependence.
>
> (Cleveland, 1985, p. xvii)

This study was intended to examine in Michigan's present educational executive leadership the degree of preference for mental processes that enhance conceptual and intergroup skills, as well as enhance the abilities to visualize a course for future action/change, and to persuade organizational members to follow toward organizational goal achievement.

CHAPTER III

THE METHODOLOGY OF THE STUDY

INTRODUCTION

The Descriptive Survey Method was utilized in this study to delineate as precisely as possible the outstanding characteristics of mental processes that constitute "executive thought" in chief educational administrators in the State of Michigan. Many research studies over the years have focused on executive behaviors; only recently, with the increased knowledge from brain/mind research, have studies been conducted which observed and attempted to describe mental processes which influence executive action (Torbert, 1983; Mintzberg and Waters, 1983; Pondy, 1983; Weick, 1983).

In examining the brain dominance patterns of the present educational executive leadership, this study attempted to determine primarily if there were any significant differences between chief administrators representative of diverse educational institutions in the State of Michigan, and secondarily between chief administrators and those who were top level administrators--with focused responsibilities--and who, in all probability, are the most ready pool of experienced candidates for chief executive positions. The study also investigated the effects of such intervening variables as: number of years experience, institution size, and type of community location on the chief administrators.

The study incorporated the following procedures to obtain the sample and the data:

1. Identified the various types of educational institutions in the State of Michigan and potential population sizes.

2. Selected a representative sample from the five identified institutional types that would allow observation and description of the mental characteristics of the total chief administrator population.

3. Sent a letter of invitation to all potential participants with specific explanation of the parameters of the study and an enclosed consent card.

4. Consenting participants completed a personal survey of their own brain dominance patterns using the Herrmann Brain Dominance Instrument.

This chapter discusses the methods and procedures used to complete this study. The rest of the chapter is designed around three major sections: (1) Procedures Used for Selecting the Population and Sample for Study; (2) The Herrmann Brain Dominance Instrument; and (3) Statistical Design and Procedures of the Study. The variables considered in the study were brain dominance categories, administrative position, and institutional type.

PROCEDURE USED FOR SELECTING THE POPULATION AND SAMPLE

Selecting the Population

The focus of this study was Chief Educational Administrators in the State of Michigan. In selecting the study population, which was intended to reflect different executive administrative demands and environments, this researcher utilized "independence of units" and "representativeness" as two desirable characteristics of a population from which to generalize the findings (Long, Convey, Chwalek, 1985, p. 86).

Four levels of educational institutions in the state were identified: (1) Four-year colleges and universities; (2) Two-year community colleges; (3) K-12 public schools; and (4) Educational service organizations (i.e. Intermediate School Districts and the State Department of Education which provide special education, technical and vocational education, information processing services, and professional and curriculum development opportunities). These four levels, or "independent units" allowed for stratified sampling (Leedy, 1985, p. 157).

The numbers of chief administrators in each of these levels were uneven due to the varying numbers of institutions at each: 15 four-year college/university presidents; 29 two-year community college presidents; 530 public school superintendents; 57 ISD superintendents and one state superintendent of schools--a total chief executive population of 632. The table of random numbers technique could not be

used with consistency through all levels because of the small populations in higher education institutions. In addition, the cost of mailings/printing to survey the entire population was prohibitive for this researcher since no grant monies were sought to support the study. Yet representativeness was essential.

A representative population of the public school superintendents was determined: (1) All superintendents of schools serving student populations of 5000+ were selected for the complexity of their structure and the variety of consituent groups. This group totalled 58. (2) The majority of districts in the state are average to small in size. To give another "level" which would represent these types of districts, and at the same time be identified through a statewide organizational structure, all districts outside the state aid financing formula which were not included in the 5000+ group were chosen. This group totalled 77. This breakdown of the public school superintendents increased the population stratification to five levels.

The literature survey showed behavioral differences between chief executives and top level managers with technical or functional responsibilities. (Wortman, 1982; Schein, 1985). Since top level administrators are logical candidates for the chief positions, this researcher wished to study the differences in brain dominance between these two groups. Again, financial constraints limited the numbers in this study. Two groupings of top level administrators were

established: (1) those with responsibilities for academic affairs or curriculum and instruction; and (2) those responsible for business and financial affairs. The researcher selected representative groups from higher education and public school levels: Top level administrators from four-year and two-year higher education institutions, and those from public schools of 5000+ student populations, made up three study groups.

The potential study populations in these three groups were: (1) 15 academic officers and 15 finance officers from four-year schools; (2) 27 academic officers and 23 finance officers from two-year schools; and (3) 55 curriculum assistant superintendents and 55 business assistant superintendents from 5000+ public schools.

Of all the chief educational administrator positions (632) in the State of Michigan, only two percent are filled by women (two community college presidents and eight school superintendents). This researcher was interested in seeing what brain dominance patterns were represented by women executives, though no statistical studies could be made. The two women college presidents were already included; the eight superintendents were invited to participate in the study.

The 1987 Edition of the Michigan Education Directory was utilized for identifying individuals, their titles of responsibility, and addresses. The reduced numbers of top level administrators compared with the numbers of chief administrators at each level was due either to shared

responsibilities in the organizational structure (therefore no top level individual could be identified), or the position was vacant at the time of population selection. The total study population of chief educational administrators was 245, and the total population for top level administrators was 190, providing a grand total study population of 435.

Sampling Procedure

Random sampling of these stratified subpopulations was achieved by inviting all individuals within each group to participate in the study; those who participated and returned a correctly completed survey instrument constituted the randomness of the sampling--all were included in the study (Leedy, 1985, p. 156-157). Surveying by mail has the advantage of allowing respondents as much time as they require to consider each question carefully before answering. At the same time, this is a limitation of the study because it transfers a great deal of control to the subject who may fill it out hastily and without reflection, or may consult friends or family members regarding their answers. There is no way for the researcher to detect or control these negative influences or their effects" (Williamson, 1982, p. 132). It is also possible that a particular pattern of brain dominance may have influenced the tendency to complete the survey. However, in order to study individual brain dominance patterns across a large population, this researcher believed the survey method of willing respondents was the most realistic approach.

A letter of explanation and request for participation was sent to a potential study population of 435 individuals. Stamped and addressed consent cards, outlining the rights of the participant in accordance with the guidelines of the Michigan State University Committee on Research Involving Human Subjects, were enclosed. Upon the receipt of a consent card, a brief instruction sheet, a copy of the Herrmann Brain Dominance Survey Instrument (HBDI), and a self-addressed, stamped envelope were mailed. When a completed instrument was returned, it was scored and an individual Profile and Consolidated Score Sheet with accompanying interpretive materials were sent to the respondent in return for their participation. (See Appendix A for initial contact materials.)

Positive responses were received from a total of 278 individuals. (See Table I) The small numbers of higher education participants would be a limitation on statistical tests of significant differences between populations. This response rate from the total group was quite positive in view of the personal nature of the study and the sensitive public image of the roles of chief and top level administrators. Since the response was completely voluntary, there was no attempt at a follow-up or second request. There were some responses which were incorrectly completed. Letters of explanation for correct completion and a xeroxed copy of the incorrect section were returned for a corrected response.

TABLE I
RETURNS OF HBDI SURVEYS FOR INCLUSION IN STUDY

INSTITUTION/POSITION	TOTAL SENT	HBDI RETURNED	%	HBDI CORRECT FOR STUDY	%
TOTAL STUDY GROUP	***435***	***278***	***64***	***232***	***53***
4-year University Presidents	15	7	47	7	47
4-year Academic Officers	15	6	40	5	33
4-year Financial Officers	15	8	53	7	47
2-year College Presidents	29	15	52	12	41
2-year Academic Officers	27	12	44	11	41
2-year Financial Officers	23	14	61	13	57
K-12 5000+ Superintendents	58	36	62	33	57
K-12 5000+ Curriculum Superintendents	55	34	62	25	45
K-12 5000+ Financial Superintendents	55	33	60	25	45
K-12 4999- Superintendents	77	63	82	47	61
ISD Superintendents	58	43	74	40	70
Women Superintendents	8	7	88	7	88

Herrmann Brain Dominance Inventory

The Herrmann Brain Dominance Inventory (HBDI) is a paper-pencil, self-survey questionnaire containing 120 questions. The instrument was developed by Herrmann (1976-1981) for use in identifying different brain dominance classifications, and cognitive and personality styles among management education workshop participants. The HBDI is a combined biographical/preference questionnaire that deals with such topics as college major and occupation, preferred work elements, best/worst subjects in school, and hobbies.

The instrument uses preference ratings for adjectives or phrases descriptive of individuals, and of work and leisure activities. Questions related to brain structure are included which record handedness, language center, motion sickness and energy level. A final section, "Twenty Questions" is intended to obtain further information on preferences for creative/intuitive approaches vs. disciplined, safekeeping approaches to problem solving.

Administration of the instrument is easy and convenient, taking 20-30 minutes to complete. The instruments have been used in the following ways:

1) To provide trainers with information about the learning styles and preferences of workshop participants;
2) To provide individual reports to the participants describing their personal styles and preferences;
3) To help participants appreciate and value their own profile and those of others who may be different;
4) To demonstrate significant similarities and differences in communication;
5) To provide the basis for assembling a composite "whole-brain" group for educational and problem-solving activities.

The instrument utilizes a quantitative scoring procedure with the twelve sections given relative weightings of importance. The Consolidated Scoresheet translates the data into a numerical interpretation of the individual sections as they relate to four quadrants representing the structure and specialized functions of the brain. The Profile sheet

provides an immediate, visual display of an individual's brain dominance, demonstrating the location and intensity of preferred modes of thinking.

THEORETICAL MODEL

For more than two decades the emphasis in discussion about brain hempisphere specialization has typically focused on the dominance of right and left hemispheres in individuals. The Fourfold Model of Multiple Brain Dominance (Bunderson, Olsen, and Herrmann, 1982, p. 3) posits the existence of not just two dominance classifications, but rather four distinct and measurable dominance categories: each hemisphere has two distinct anatomical sections--cerebral and limbic--which process information in different ways.

The Fourfold Model utilizes descriptive adjectives pertaining to the four categories generally consistent with the work of a variety of brain researchers. The term brain dominance is used to denote two things. First, it denotes a preference for one of the four categories of brain processing over another. Second, it denotes an ascendence of one type of process over another in competing for what might be called attentional resources. The Fourfold Model states that even as individuals have a characteristic comfort and preference for one hand over the other, one eye over the other, etc. they have a charateristic comfort, preference, and dominance in dealing with the types of information processing

activities characterized by the four quadrants as described in Figure 3.

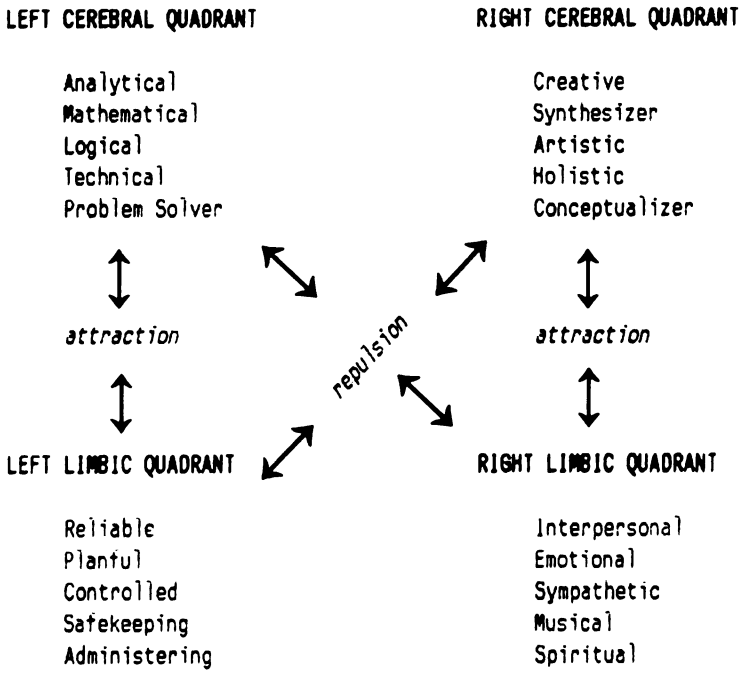


FIGURE 3
Fourfold Model of Brain Dominance

The theory further asserts that there is a negative correlation in the population between right and left. That is, if a person is right brain dominant it is less likely that this person will simultaneously have a strong left brain preference. This repulsion is strongest between the diagonal elements. That is, the model asserts a strong repulsion between cerebral right and limbic left, and between cerebral left and limbic right. It asserts a weaker repulsion between the cerebral left and the cerebral right, or between limbic

left and limbic right. The model also asserts that there is an attraction between cerebral left and limbic left and between cerebral right and limbic right. This implies an overall left versus right brain dominance.

Despite the assertions above, the theory does not posit an either/or situation. It asserts that individuals can have multiple dominance; that is, a preference or comfort in dealing with processes characteristic of two or more of the four types of brain processing. Restated: (1) The same-side combinations are much more likely than dual-side combinations. (2) Cerebral pairs or limbic pairs are more likely than cross-cerebral/limbic pairs. The repulsion and attraction concepts represented in this model were demonstrated in a correlation study by Bunderson and Olsen in 1981, summarized in Figure 4.

The power of the Fourfold Model of Brain Dominance appears to be related to the pervasiveness and sweep of the

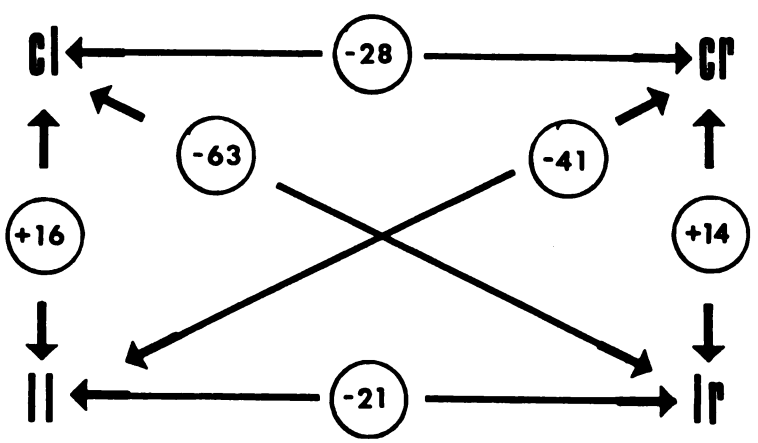


Figure 4: Repulsion/Attraction Concepts of Multiple Brain Dominance
"Correlations Among the Four Categories of Dominance"

SOURCE: Bunderson, C. V., J. B. Olsen, and W. E. Herrmann, "A Fourfold Model of Multiple Brain Dominance and its Validation through Correlation Research." unpublished paper. 1982.

left and right hemisphere constructs across several dimensions of individual differences: cognitive ability, personality, learning styles and strategies, and performance tests.

VALIDITY

Construct Validity Studies

An extensive construct validity study was undertaken to "identify a practically useful and theoretically coherent set of learning profile measures which could be used in management and instructional settings" (Bunderson, 1982, p. 23). In the first phase of the study (1980) a learning profile battery which consisted of fifteen instruments, which in some way measured patterns of hemisphere dominance, were selected for an initial profile battery administered to 145 persons, college students and managers. The scores were factor analyzed to yield eight interpretable factors:

1. Left versus Right Hemisphere Dominance
2. General Fluid and Visual Intelligence on Timed Tests
3. Use of Multiple Learning Strategies
4. Thinking versus Feeling
5. Verbal Quantitative Thinking Style
6. Holistic Non-Verbal Thinking Style
7. Visual vs. Verbal Learning Preference
8. Use of Learning Expansion Strategies

The eight factors accounted for 60 percent of the total variance in the correlation matrix of profile scores. This study demonstrated the pervasiveness of the left and right

dominance constructs across several domains of individual differences.

In the second phase of this validation process (1981), the HBDI was administered to 439 employed adults from a variety of professions and occupations. The factor analysis of these scores yielded seven factors:

1. Controlled, Organized (LL) versus Creative Synthesizer (CR)
2. Introversion versus Extroversion
3. Analytical, Logical (CL) versus Interpersonal, Emotional (LR)
4. Visual Learning Preference
5. Visual Closure
6. Verbal Learning Preferences
7. Analytic, Mathematical Style

Actually, two factor analyses were employed with the second study group. The first study provided strong construct validation information about the four quadrant scores of the Fourfold Model--reliable, analytical, synthesizer, and interpersonal. The second study provided construct validation information for the left and right dominance scores. The HBDI scores were then cross-validated with the scores from the learning profile battery as predicted.

Though most of the instruments in the learning battery presumed an either/or dominance score, the Fourfold Model assumes that some individuals will be double, triple dominant, or even "whole brained." The factor analytic data demonstrated the multiple brain dominance, even though the pattern is exceptional. The relationships of the four brain

dominance scores across the other categories of mental ability of the other instruments ranged from modest to strong, but in predicted directions with but few exceptions.

A third validation study is presently in process in the form of a PHD dissertation based on the scores of 8000 instruments under the supervision of Dr. Victor Bunderson, Vice President of Research Management, Educational Testing Service (Herrmann, 1986).

Criterion-Referenced Study

There has been increasing interest in career choices which reflect the dominant use of one hemisphere. One such study conducted an experiment in which the EEG waveforms of persons in two very different career fields were compared with the predictions of brain dominance in the HBDI. This study was conducted jointly by the Departments of Biomedical Engineering and Systems Analysis at the University of Texas at Arlington (Schkade, 1981, p. 330). The basis of the analysis consisted of computing the ratio of the power of the EEG waveform of the left hemisphere to that of the right hemisphere for each subject, and computing the mean ratio for all subjects in each of the two career groups.

The experimental results indicate that accountants and artists have very different cognitive styles that are manifested physiologically. In terms of the ratio of the power of the hemispheres, a value of 1.0 would indicate no dominance (equal uses of each hemisphere), a ratio of less than one indicates dominant use of the left hemisphere, while

a ratio greater than one indicates dominant use of the right hemisphere. In this study of 12 accounting students and 12 studio art students, the mean power ratio for accounting students was 0.77 while the corresponding ratio for art students was 1.2, a statistically significant result that is expected to result randomly with a probability less than 0.001. The experimenters then examined the validity of the predictions of the HBDI in the hopes of finding a less time-consuming and expensive method for determining hemisphere dominance than the EEG. The validity of the HBDI was supported precisely by the findings of the EEG (Schkade, p. 331).

RELIABILITY

A survey instrument is uniquely capable of generating a broad range of data about the characteristics of a "target" population. Weick (1983) suggests that executive thinking is inseparably woven into and occurs simultaneously with action: "thinking qualifies activity, thinking provokes activity, and thinking intensifies activity" (p. 222). Massarick (1983) asserts that managers do not function in terms of fixed categories or labels--rather there is a complex intertwining of rationality and intuition, which "merges into a PATTERNED WHOLE as the executive goes about his or her business (p. 250). In order to study executive mental processes, only a limited range of individual differences is sufficiently public for a researcher to study them

directly. Therefore, a survey instrument provides the vehicle for individual introspectivenss and self-awareness to be revealed for the purposes of observation and examination.

Williamson, et.al. (1982) point out some of the problems in subjective self-reports:

> ...the motives behind what people report (and what they fail to report) about themselves are a great deal more complex than any pure desire to provide the researcher with an accurate account. The motives of avoiding painful or embarrassing self-revelation and of highlighting personal qualities that may lead to respect or prestige make it difficult to assume that survey respondents' reports about either their actions or their attitudes are, in all cases, accurate (p. 157).

The HBDI has proved to be a survey instrument that is flexible and adaptable in terms of a wide variety of subjects and occupations, and produces replication of brain dominance patterns as they relate to an individual's mental preferences and the occupation they have chosen (Herrmann, 1986, p. 20).

To date well over 150,000 HBDI instruments have been processed in training sessions worldwide. These completed instruments have been collected in a data bank at the Brain Dominance Institute for the purpose of creating a data base, or scientific sample, from which to generate norms for occupations, and to provide a basis for continuing brain dominance research. Revised educational and occupational weightings which are used in the scoring of the HBDI have been completed in 1986 for 179 educational and 784 occupational categories. These weightings are based on a sample of

nearly 10,000 individuals. Weighting decisions were determined by correlating actual total scaled scores against the existing HBDI educational and occupational weightings combined with accumulated knowledge, and the statistical research that has been gathered from 1982 to 1986.

From this same data bank 31 profile patterns ranging from single to whole brain dominance delineate the major characteristics of each profile and the typical occupations represented. Brain dominance patterns of individuals and occupational groups have been sufficiently replicated to demonstrate reliability.

STRUCTURE AND SCORING

"The content, wording, sequence, and structure of the questions as well as the overall layout of the questionnaire are crucial to its success" (Williamson, 1982, p. 157). The HBDI is in its sixteenth version since it was originated from opinion research at General Electric in 1976. Herrmann postulated that there is a continuum across the mental spectrum from left to right, and each person occupies a position on that contiuum. The HBDI is intended to clarify each individual's unique placement on that spectrum.

Brain dominance is an organizing principle that allows individuals to understand behavior; the Herrmann model was developed from brain research findings rather than a psychological base, therefore the questions are organized so as to reflect both brain structure and function. Questions on brain structure include 1) the location of the language

center of the brain which is indicated by handedness and the handwriting position in the dominant hand; 2) motion sickness studies (Mirabile and Glueck, 1979) indicate that right-brain dominant persons who are more inner, self-contained tend be more affected by motion than left-brain dominant individuals who are more involved with controlling the external environment; 3) energy level is often associated with time of day and hemisphere dominance--day people tend to be left brained and night people, right brained.

The survey form begins with questions of a biographical nature that are immediately accessible and non-threatening: Educational Focus, Occupational position and description of the nature of work, Handedness/writing position, and Best/Worst subjects in elementary and secondary schooling. The next two sections, Work Elements and Key Descriptors, are focused on the descriptive adjectives or behaviors which are personal in nature and reflect a dominance "tilt" toward each of the four quadrants of the Fourfold Model of Brain Dominance, and as correlated in the factor analysis studies of 1981 (Bunderson, Olsen and Herrmann). These two sections require the respondent to weigh mental and behavioral preferences as they think about themselves, and code them in a manner that demonstrates dominance.

A section on Hobbies follows, giving relief from areas where an individual might feel the potential for being "judged". Hobbies consistently demonstrate the duality individuals express in their discretionary time when there

are no economic constraints; the answers in this section often indicate individual preferences most strongly and are utilized as supportive data to the work elements and key descriptors. The brain structure elements of energy level and motion sickness precede a dominance function section, Adjective Pairs, which asks for a forced-choice response to 24 adjective pairs. The results of this section also provide further confirmation of the four quadrant scores of the earlier preference sections. The next section of the questionnaire is focused on introversion and extroversion. Correlation studies with the Myers-Briggs Type Indicator (Bunderson, 1981) indicate that left-brain dominance correlates with introversion and right-brain dominance, extroversion. The structure of the question allows the respondent to mark his/her perceived position on a scale ranging from left/introversion to right/extroversion.

The final section of the HBDI is entitled "20 Questions". This was the last segment to be included in the final form of the survey in 1980. The questions represent right or left value-laden issues, intended to obtain further information on preferences for creative/intuitive/risk-taking approaches versus ordered/disciplined/safe-keeping approaches to problem solving.

The scoring of the HBDI is accomplished by counting up the mathematical values of each item in each section according to a dominance tilt toward each of four quadrants. The scores for all sections are then summed to provide a

dominance score for left and right hemispheres and cerebral and limbic levels. The raw scores for each of the four quadrants--left cerebral, left limbic, right limbic, and right cerebral--are multiplied 1.5 to obtain scaled scores which are then plotted out on a circular interval scale, the Herrmann Brain Dominance Profile.

The Profile is intended as a visual, metaphorical model of brain physiology, utilized most often in workshop settings to facilitate both individual and group understanding of the significance of individual brain function and information processing preferences. The model is divided vertically into the specialized hemispheres--right and left. In the brain's structure, these two hemispheres are connected by the corpus callosum--200 million+ nerve fibers which provide rapid, oftentimes instantaneous communication between the two different perceptual and processing brains. Brain dominance theory suggests that a person could exhibit and use the characteristics and strategies of both left and right hemispheres situationally, moving back and forth with ease.

In addition, the model is divided horizontally into the cerebral (top) and limbic (bottom) areas of the brain. The resulting four quadrants provide a clarifying framework for an individualized profile. While the cerebral hemispheres are thought of as the more cognitive, intellectual parts of the process, the limbic system is becoming better understood as the more organized and emotional part of the brain,

transforming information as input into memory. The Herrmann Brain Dominance Profile shows visually the thinking preferences as measured by the Herrmann Participant Survey Form. Relative preference is determined by a scale running from 0 to 100 and beyond, beginning at the center of the circle and extending outward toward the edge in each of the four quadrants.

>> Thinking modes that individuals tend to avoid would fall within the range of 0 - 33. This AVOID category is represented by "3" in a profile code.

>> Modes frequently used fall between 34 - 66. The USE category is represented by "2".

>> Modes that they PREFER to use range from 67 - 100 and beyond, represented by "1". A quadrant that shows a "1" category is said to be dominant.

For interpretive purposes (See Figure 5), the Profile code below of 3211 would be read around the circle, counterclockwise on a continuous scale ranging from 0 to 100+. The above example indicates the left cerebral is (28) "avoid;" the left limbic, (50) "use;" right limbic, (90) "prefer;" and right cerebral, (120) "prefer." This Profile reflects a double dominance--two quadrants in the "prefer" category. In the population that has taken the HBDI, 30% are single dominant; 40%, double; 25%, triple; and 5% are dominant in all four quadrants, or "whole brained" (Herrmann, 1985). The occupational group which has most consistently demonstrated

whole-brain dominance are chief executive officers in business and industry (Herrmann, 1985).

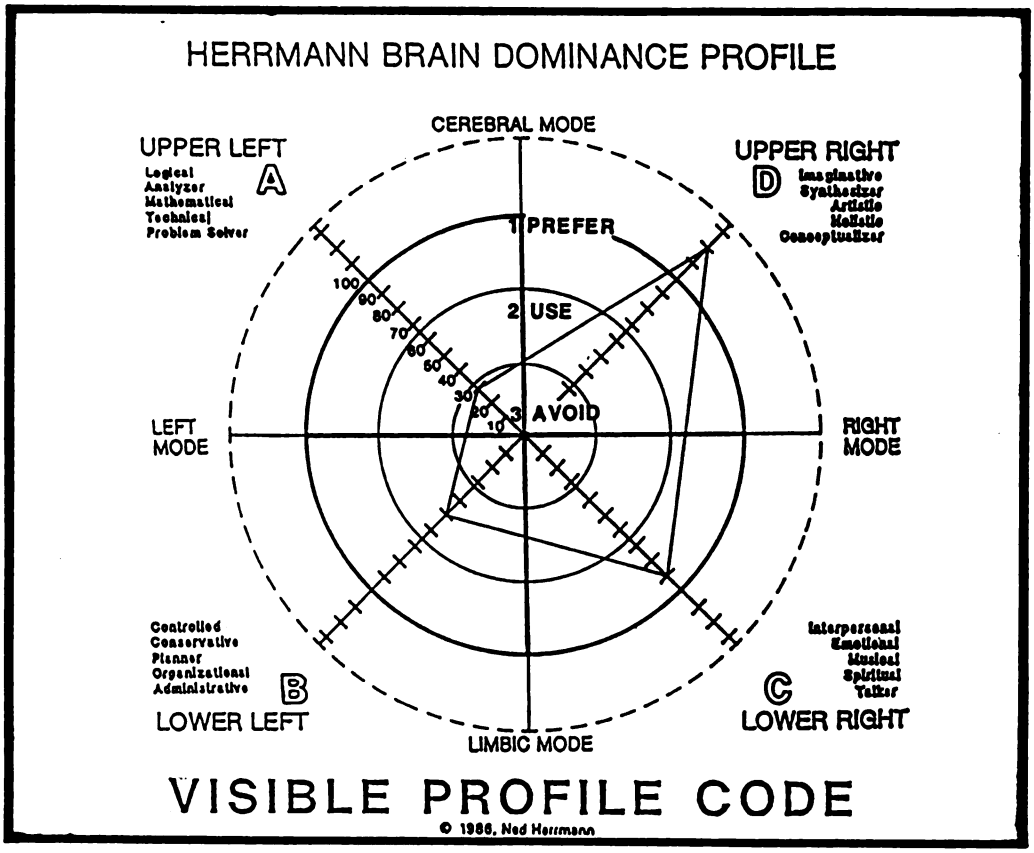


Figure 5: Graphing of HBDI Scores to Visually Demonstrate Dominance Patterns

The total picture of scores--each section of the questionnaire reflecting the placement of answers in respect to the left-right continuum--is recorded on the Consolidated Scoresheet. The relative weightings of each section are demonstrated in Figure 6. This score sheet and the Profile were sent to each respondent, along with interpretive materials (See Appendix B for the follow-up letter).

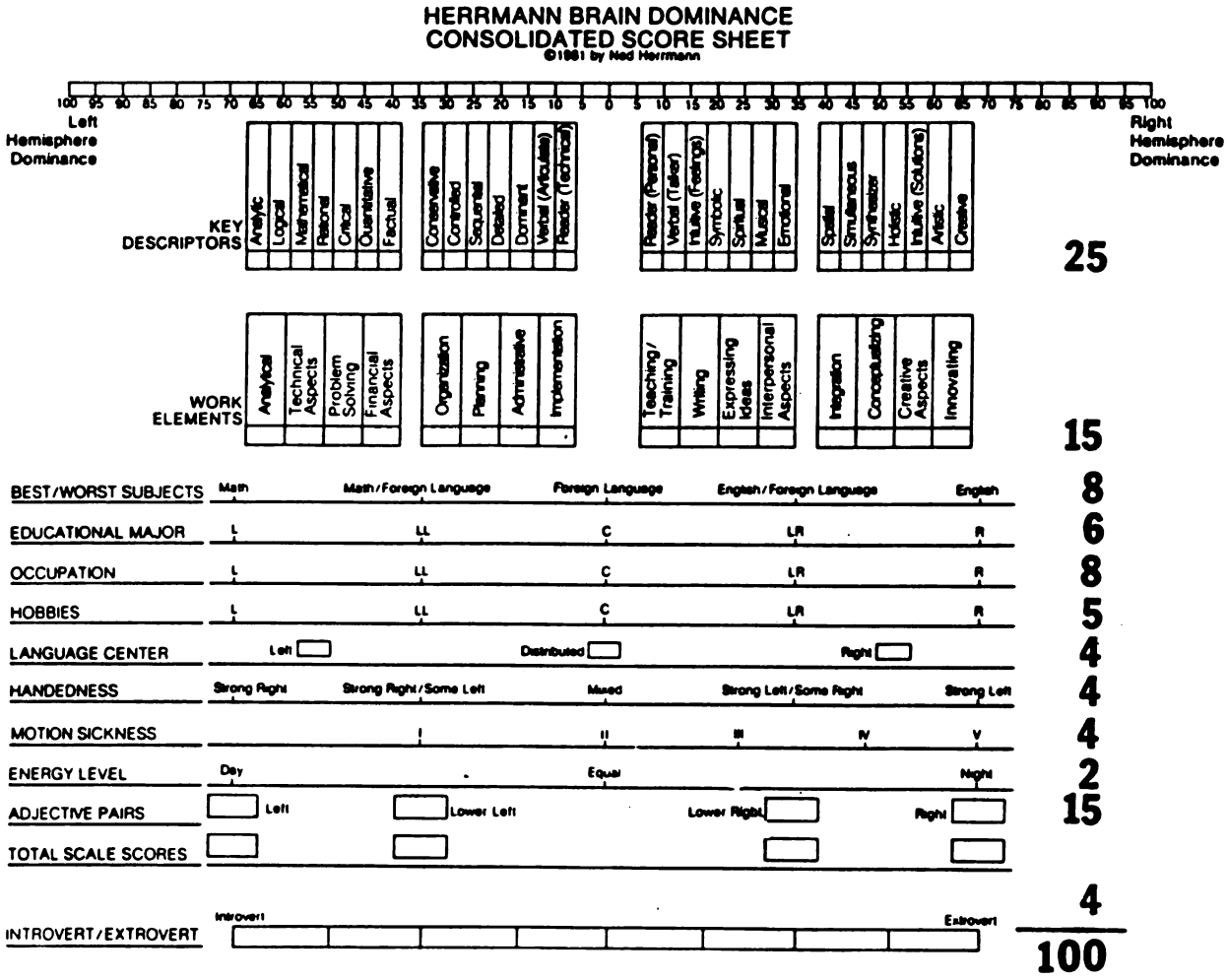


Figure 6: Relative Weightings of HBDI for Scoring

The scores that were analyzed in this study included the Profile Code, the Dominance scores for right and left hemispheres and the cerebral and limbic levels, and the four scaled scores for the quadrants derived from the Fourfold Model. In addition, a frequency distribution was done of the Key Descriptors.

APPROPRIATENESS OF INSTRUMENT

As demonstrated in the construct validity studies, other instruments measuring personality, learning and cognitive styles, learning strategies, and performance ability measured right and left hemisphere dominance, but in a bipolar, either/or framework. The literature review for this study indicates that organizational executives demonstrate an integration of hemispheric processing. The HBDI was created initially for use in management training settings, and has more recently provided data which validates brain dominance characteristics for numerous occupations. The simplicity of instructions also makes the instrument appropriate for survey by mail.

STATISTICAL DESIGN AND PROCEDURE FOR STUDY

The data in this study are considered as nominal, ordinal, and interval in nature. The nominal data include differential categories specifying administrator levels (higher education, public school, service) type/size of educational institutions,and key descriptors; the ordinal data include the greater/lesser characteristics--or degrees of difference--of the profile codes, and the years of experience; the interval data include the raw scores for left/right hemisphere dominance, cerebral/limbic dominance, and the scaled scores for the two cerebral and two limbic quadrants. Parametric statistics were employed for the analysis of the data.

The macro-design of this study includes the examination of central tendencies, the variability of scores, and analysis of variance (MANOVA). General research hypotheses, derived from a review of prior studies and theoretical literature were developed. The hypotheses were explored by attempting to answer a set of related questions. The following questions, followed by the micro-designs, composed the content of the investigation of data:

Question 1. Are there significant differences among the brain dominance patterns of educational chief administrators at identified institutional levels?

Frequency distributions and percentages of all brain dominance patterns reflected in the profile codes were analyzed to determine if differences existed among chief administrators responsible for different levels of educational institutions. Dominance patterns were graphed using group averages to visually demonstrate the degree of differences. Frequency distributions and percentages of multi- and single dominance patterns were also analyzed. Frequency distributions and percentages of attraction/repulsion concepts of multiple brain dominance were charted. Simple frequency distributions of key descriptors from the five chief administrator groups were examined and compared to previous research studies.

Variability of the raw scores for left/right dominance, cerebral/limbic dominance, and the scaled scores for left cerebral, left limbic, right limbic and right cerebral

quadrants were analyzed for the measures of dispersion through the use of range and standard deviation.

Because this study examined five chief administrator groups of varying sample size, the MANOVAs were used to test the research hypotheses.

Previous studies demonstrated that school superintendents--one level of chief administrators in this study--were more left-brained and transactional in dominance (Coulson, 1983: Norris, 1984). Review of the literature suggested that the higher the management level in business/ industrial organizations, the more right brained/transformational skills are utilized (Katz, 1974; Mintzberg, 1976; Wortman, 1982; Herrmann, 1985; Schein, 1985; Bennis and Nanus, 1985) This question investigated the brain dominance patterns of five levels of chief educational administrators to determine any patterns of consistency among groups.

A sixth level of chief administrators (women superintendents) was studied briefly without the statistical depth because of their small number in the larger population.

Question 2. Are there significant differences in the brain dominance patterns among chief administrators with academic or financial responsibilities?

The same statistical methods for central tendency, variability, and variance, as above, were utilized to answer this reasearch question. The levels studied were organized according to three groups--1) chiefs and top level administrators in 2) academics and 3) finance--and three institu-

tional levels--1) four-year higher education, 2) two-year higher education, and 3) K-12 public schools of 5000+ population.

Group averages of the different groups were graphed for the three different institutional levels in order to provide a visual demonstration of dominance differences.

Question 3. Are there any significant differences in brain dominance patterns in terms of the following variables: 1) number of years of chief executive experience, 2) size of institution, and 3) type of community in which located (urban, small city, suburban, or rural)?

Three major areas of focus comprised this question. First, it was the researcher's intent to investigate the effects of system size and the number of years of experience as a chief administrator on brain dominance patterns as indicated from the Scaled Scores of the four quadrants. Second, a third variable, community type, was examined to note any differences arising from geographic/social influences.

School system size and number of years of experience were determined by a supplemental question stamped on the top margin of the HBDI. Community type was determined through the examination of a State of Michigan map.

Statistical procedures for this question consisted of: 1) Discrete variable of Community Type: Tabulating the frequencies and percentages of the type of communities which were represented in each of the study groups; 2) Continuous

variable of Years of Experience: Tabulating the frequencies and percentages by five-year increments for each of the study groups; and 3) Continuous variable of System Size: Tabulating the frequencies, percentages and range of institution sizes represented in each study group. The MANOVA statistical test included these three variables.

SUMMARY

This study explored the brain dominance patterns of chief and top level administrators throughout the State of Michigan and investigated differences found between six levels of chief administrative groups, and three levels of top level academics and finance administrators. Chapter IV presents these research findings.

CHAPTER IV

PRESENTATION AND DATA ANALYSIS

INTRODUCTION

This study investigated the brain dominance patterns of chief educational administrators to determine what personal and work elements are characteristic of the present professional educational leadership in the State of Michigan. The primary focus of this study was on Chief administrators--the executives of the educational institutions in the state. A secondary focus was given to groups of top level administrators in academic affairs and finance who represent the most ready pool of future educational executives. Volunteer subjects from the total population of higher education presidents, intermediate school district superintendents, and selected groups from the total population of K-12 school superintendents participated; volunteer subjects from the top levels of administration in the total higher education population and from the K-12 level in school districts of 5000+ student population also participated.

Subjects in the study completed the Herrmann Brain Dominance Instrument, a paper-pencil, self-survey instrument developed to identify and measure the nature and degree of an individual's brain dominance characteristics. The HBDI provided several measurements including an individual dominance profile code, right/left and cerebral/limbic dominance raw scores, key descriptors, and scaled scores for the

dominance "degree" in each of four quadrants. Various statistical procedures were used to investigate and to determine if there were significant differences among the dominance patterns of these individuals and between the different levels. The remainder of this chapter presents those data in relation to the research hypotheses.

Data are reported for the following groups: 4-year higher education presidents (N=7), 2-year higher education presidents (N=12), K-12 5000+ school superintendents (N=33), K-12 Out-of-Formula superintendents (N=47), service organization (ISD and state department of education) superintendents (N=40), 4-year higher education academics officers (N=5), 2-year higher education academics officers (N=11), K-12 5000+ curriculum superintendents (N=25), 4-year higher education finance officers (N=7), 2-year higher education finance officers (N=13), and K-12 5000+ finance superintendents (N=25). There are 8 women school superintendents in the state; they were invited to participate. Data are reported on this group of women superintendents (N=7), and comparisons are noted with previous women executive studies. The researcher recognized the limitations of the small (7-13) populations and the application of statistical procedures. In a few analyses, the total group (Chiefs N=139, Academics N=41, Finance N=45) is used and data reported for that number of respondents.

Research Questions and Hypotheses

The major question guiding this study was to discover what patterns of brain dominance were present in the chief educational administrators in the State of Michigan. A secondary question required the examination of patterns of top level administrators who represent the most current pool of candidates for chief executive positions in educational organizations.

Three specific research questions and their null hypotheses were utilized for testing the study population for any significant differences:

Question 1. Are there significant differences in the brain dominance patterns of educational chief administrators at identified institutional levels: 1) Presidents of four-year higher education institutions; 2) Presidents of two-year higher education institutions; 3) Superintendents of K-12 school districts of 5000+ student populations; 4) Superintendents of K-12 school districts which represent a range of student populations from 4999 to 200; 5) Superintendents of intermediate school districts and the Superintendent of Public Instruction.

Null hypothesis tested: There are no significant differences in the brain dominance patterns of chief administrators at identified institutional levels.

Question 2. Are there significant differences in the brain dominance patterns among chief administrators versus top level administrators with focused responsibilities: 1)

Presidents of higher education institutions versus top administrators responsible for faculty and academic affairs; 2) Presidents of higher education institutions versus top administrators responsible for finance and business affairs; 3) Superintendents of school districts versus top administrators responsible for curriculum/instruction; 4) Superintendents of school districts versus top administrators responsible for finance and business.

Null hypothesis tested: There are no significant differences in the brain dominance patterns among chief administrators versus top level administrators with focused responsibilities.

Question 3. Are there any significant differences in brain dominance patterns of chief administrators in relationship to the following variables: 1) number of years of chief executive experience, 2) size of institution, and 3) type of community in which located (urban, suburban, small city, or rural)?

Null hypothesis tested: There are no significant differences in brain dominance patterns of chief administrators in relationship to the variables of years of experience, size of institution, or type of community.

PRESENTATION OF THE DATA

The data will be organized in three different categories most commonly examined in the interpretation of the HBDI: Dominance Profile Codes; Right/Left and Cerebral/Limbic Dominance Raw Scores; and Scaled Scores for the Four

Quadrants of Brain Dominance. When all of the data have been presented, a section will follow which summarizes the findings in light of each hypothesis, noting the evidence for its support or non-support.

Dominance Profile Codes

The profile codes are a "shorthand" method for understanding an individual's mental preferences. The four-digit code indicates a generic category into which each profile falls. By way of comparison, human blood can be typed, yet there are further characteristics that make an individual's blood unique. There are 81 possible generic classes of brain dominance profiles, with 17 occurring most frequently. All 17 occurred in this study population; 9 other dominance codes were present which included 28 participants (12 percent of the total study population). There is a four-digit code assigned to each generic category; each digit represents either a primary dominance (1), a secondary (2), or a tertiary preference (3) for each of the four quadrants of the brain dominance model.

This numerical representation is based on the continuous scaled scores of each of the four quadrants:

>> Thinking modes that individuals tend to avoid would fall within the range of 0-33. This *AVOID* category is represented by "3" in the Profile Code.

>> Modes frequently used fall between 34-66. The *USE* category is represented by "2".

>> Modes that individuals *PREFER* to use range from 67-100 and beyond, represented by "1". A quadrant that shows a "1" category is said to be dominant.

The code starts in the cerebral left quadrant and pro ceeds counter-clockwise (Refer to page 74). Each code falls on a continuum beginning with 1333 through 1212 in the Left Cerebral quadrant, around and through the Left and Right Limbic quadrants, ending in the Right Cerebral quadrant with 2121 through 3331 (See Figure 7).

Table II presents the frequency distributions by dominance profile code for all subjects in the study. As shown in the table, the most prevalent brain dominance patterns for the total group of chief administrators, including the women, (N=146) were:

1. 1122 with a frequency of 33 (representing 23 percent of the group).

2. 1121 with a frequency of 25 (representing 17 percent of the group).

3. 2111 with a frequency of 16 (representing 11 percent of the group).

4. 1221 with a frequency of 15 (representing 10 percent of the group).

5. 2121 with a frequency of 11 (representing seven percent of the group).

The most prevalent patterns for the top level academics administrators (N=41) were:

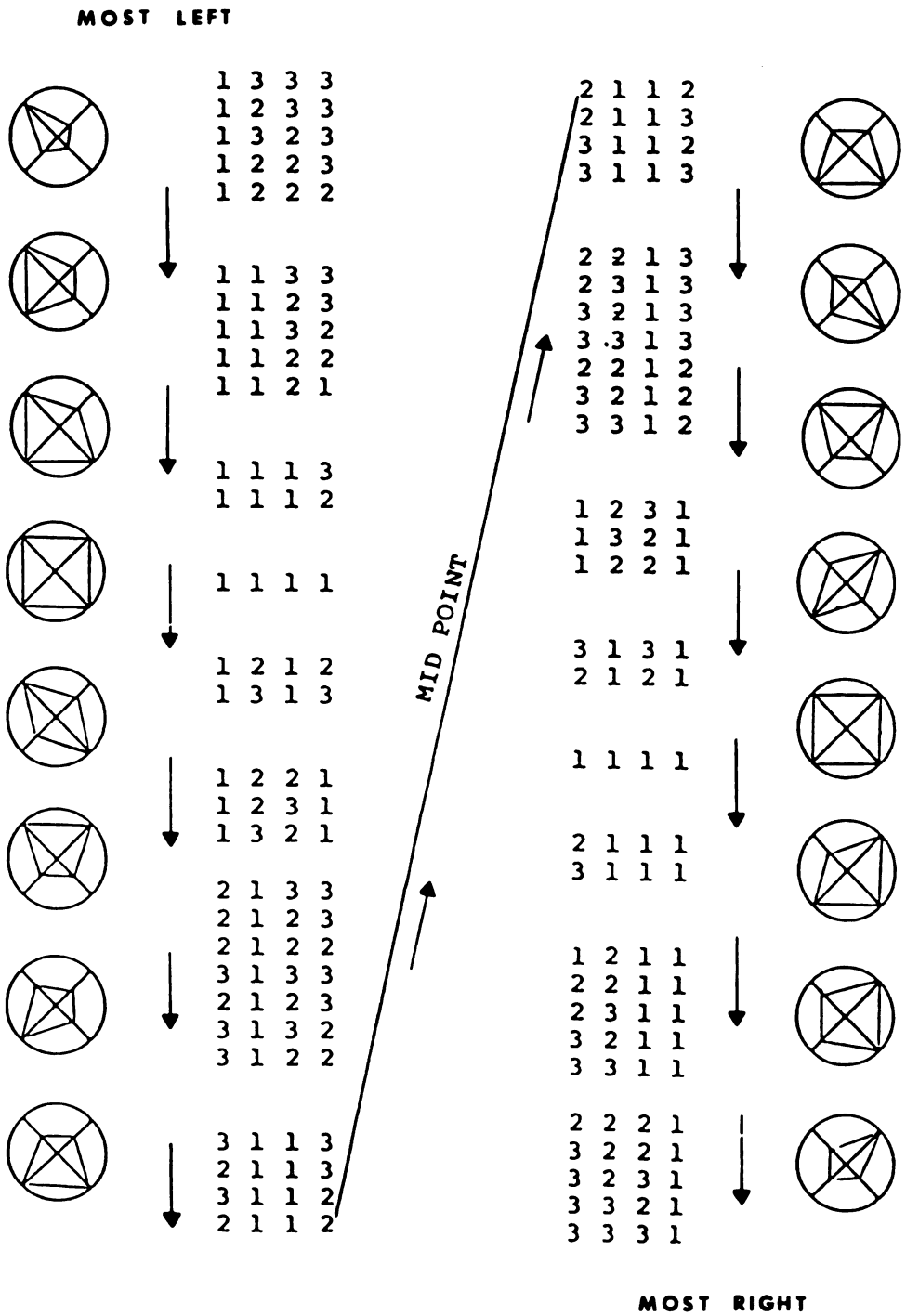


FIGURE 7

Profile Code Order for Continuum of the Herrmann Brain Dominance Instrument

(Circular symbols are a visual representation of dominance in one or more quadrants.)

1. 1121 with a frequency of seven (representing 17 percent of the group).

2. 1122 and 2211 each with a frequency of five (each representing 12 percent of the group).

3. 2112 with a frequency of four (representing 10 percent of the group).

4. 2111 with a frequency of three (representing seven percent of the group).

TABLE II
FREQUENCY DISTRIBUTION OF CHIEF/ACADEMIC/FINANCE ADMINISTRATORS IN MICHIGAN, 1987

	CHIEF ADMINISTRATORS				ACADEMIC ADMINISTRATORS				FINANCE ADMINISTRATOR			
DOMINANCE CODE	f	%	Cum. f	Cum. %	f	%	Cum. f	Cum. %	f	%	Cum. f	Cum. %
1111	5	3	5	3	1	2	1	2	0	0	0	0
1112	8	5	13	8	2	5	3	7	3	7	3	7
1113	1	1	14	9	0	0	3	7	0	0	3	7
1121	25	17	39	26	7	17	10	24	6	13	9	20
1122	33	23	72	49	5	12	15	36	14	31	23	51
1123	4	3	76	52	1	2	16	38	2	4	25	55
1131	2	1	78	53	1	2	17	40	4	9	29	64
1132	3	2	81	55	1	2	18	42	4	9	33	73
1133	0	0	81	55	0	0	18	42	2	4	35	77
1211	3	2	84	57	2	5	20	47	0	0	35	77
1212	0	0	84	57	1	2	21	49	0	0	35	77
1221	15	10	99	67	1	2	22	51	3	7	38	84
1222	1	1	100	68	0	0	22	51	1	2	39	86
1231	1	1	101	69	0	0	22	51	1	2	40	88
2111	16	11	117	80	3	7	25	58	2	4	42	92
2112	3	2	120	82	4	10	29	68	1	2	43	94
2121	11	7	131	89	2	5	31	73	1	2	44	96
2131	1	1	132	90	0	0	31	73	0	0	44	96
2211	6	4	138	94	5	12	36	85	1	2	45	98
2221	2	1	140	95	1	2	37	87	0	0	45	98
2321	1	1	141	96	2	5	39	92	0	0	45	98
3111	2	1	143	97	2	5	39	92	0	0	45	98
3121	1	1	144	98	0	0	39	92	0	0	45	98
3211	2	1	146	99	2	5	41	97	0	0	45	98

** FINAL PERCENTAGES REFLECT ROUNDING

The most prevalent patterns for the top level finance administrators (N=45) were:

1. 1122 with a frequency of 14 (representing 31 percent of the group).

2. 1121 with a frequency of six (representing 13 percent of the group).

3. 1131 and 1132 each with a frequency of four (each representing nine percent of the group).

4. 1221 with a frequency of three (representing seven percent of the group).

Table III presents the most frequent dominance profile codes by each administrative group. As shown, Chief and Finance administrators have 1122 as their most prevalent code; Academic administrators' most prevalent code is 1121. Of the top three occurring groups of the total study group, all but three dominance patterns are

TABLE III

FREQUENCIES AND PERCENTAGES OF MOST PREVALENT DOMINANCE PATTERNS AMONG CHIEF/ACADEMICS/FINANCE ADMINISTRATORS (N=232) IN MICHIGAN, 1987

GROUP	PRIMARY CODE	N=	%	SECONDARY CODE	N=	%	TERTIARY CODE	N=	%
CHIEF ADMINISTRATORS	1122	33	23	1121	25	17	2111	16	11
ACADEMIC ADMINISTRATORS	1121	7	17	1122	5	12	2112	4	10
				2211	5	12			
FINANCE ADMINISTRATORS	1122	14	31	1121	6	13	1112	3	7
							1221	3	7

characterized by left-hemisphere dominance on the profile code continuum: Academic administrators have 2211 occurring as the second most frequent code (representing 12 percent of their level), Chief administrators have 2111 occurring as the third most frequent code (representing 11 percent of their level), and Finance administrators have 1221 occurring as the third most frequent code (representing seven percent of their level). The 1221 code can tilt either to the left or to the right depending on the
scaled scores of the four quadrants. Later examination indicates that the finance officers in this study, demonstrating this 1221 code tilt to the left.

Another approach to analyzing the Profile Codes is to examine the occurrences of multi-dominance. As has already been noted, a "1" represents a dominant quadrant. The power of the Herrmann Brain Dominance model is that persons are not limited to an either/or process of mental competencies, but rather have the natural potential for development and access to all four quadrants. Individuals range from a single dominant quadrant to "whole brain"--exhibiting a preference for and a willing access to all four quadrants.

Table IV presents the frequencies of single, double, triple, and whole-brain dominance patterns for the entire study population, displayed according to the twelve administrator levels. In the general population that has

TABLE IV

FREQUENCY DISTRIBUTIONS OF MULTIPLE AND SINGLE DOMINANCE PATTERNS
TOTAL STUDY GROUP N=232

GROUP	WHOLE BRAINED N=	%	TRIPLE DOMINANCE N=	%	DOUBLE DOMINANCE N=	%	SINGLE DOMINANCE N=	%	
GENERAL HBDI POPULATION (N= 150,000)		5		25		40		30	
CHIEF ADMINISTRATORS (N=146)									TOTALS
4-YEAR HIGHER ED PRESIDENTS	0		6		1		0		
Percent of Study Group (7)		0		86		14		0	
2-YEAR HIGHER ED PRESIDENTS	0		4		8		0		
Percent of Study Group (12)		0		33		67		0	
K-12 5000+ SUPERINTENDENTS	1		14		15		3		
Percent of Study Group (33)		3		42		45		10	
K-12 O.F. SUPERINTENDENTS	4		16		27		0		
Percent of Study Group (47)		9		34		57		0	
ISD SUPERINTENDENTS	0		14		25		1		
Percent of Study Group (40)		0		35		63		2	
WOMEN SUPERINTENDENTS									
Percent of Study Group (7)	0		3		4		0		
		0		43		57		0	
Subtotals: Incidence of Dominance	5		57		80		4		146
ADACERIC ADMINISTRATORS (N=41)									
4-YEAR HIGHER EDUCATION	0		4		1		0		
Percent of Study Group (5)		0		80		20		0	
2-YEAR HIGHER EDUCATION	1		3		6		1		
Percent of Study Group (11)		9		27		54		9	
K-12 5000+ PUBLIC SCHOOLS	0		9		16		0		
Percent of Study Group (25)		0		36		64		0	
Subtotals: Incidence of Dominance	1		16		23		1		41
FINANCE ADMINISTRATORS (N=45)									
4-YEAR HIGHER EDUCATION	0		4		3		0		
Percent of Study Group (7)		0		57		43		0	
2-YEAR HIGHER EDUCATION	0		1		12		0		
Percent of Study Group (13)		0		8		92		0	
K-12 5000+ PUBLIC SCHOOLS	0		10		14		1		
Percent of Study Group (25)		0		40		56		4	
Subtotals: Incidence of Dominance	0		15		29		1		45
TOTAL STUDY GROUP N=232	6		88		132		6		232
Percent of Total Group		3		38		57		3	

completed the HBDI--approximately 150,000 persons--30 percent are single dominant; 40 percent, double; 25 percent, triple; and five percent are whole-brained.

In this total study population grouped by levels of administrators, single dominance occurred four times in the Chief group (three percent of this group); once in the Academic group (two percent); and once in the Finance group (two percent). Double dominance occurred 80 times in the Chief group (55 percent); 23 times in the Academic (56 percent); and 29 times in the Finance group (64 percent). Triple dominance occurred 57 times in the Chief group (39 percent); 16 times in the Academic group (39 percent); and 15 times in the Finance group (33 percent). There were five occurrences of the Whole-brain code in the Chief group (three percent) and one in the Academic group (two percent); there were no occurrences of this code in the Finance group.

The total group of educational administrators differ from the general HBDI study population with marked increases in the incidence of double and triple dominance: Single: 30 percent in the HBDI population versus three percent in this study; Double: 40 percent in the HBDI versus 57 percent in this study; Triple: 25 percent in the HBDI versus 38 percent in this study; and Whole-Brain: five percent in the HBDI versus three percent in this study.

Another concept arising from the multiple dominance representation of the Profile Code is the direction of interaction between quadrants. Herrmann has labeled these

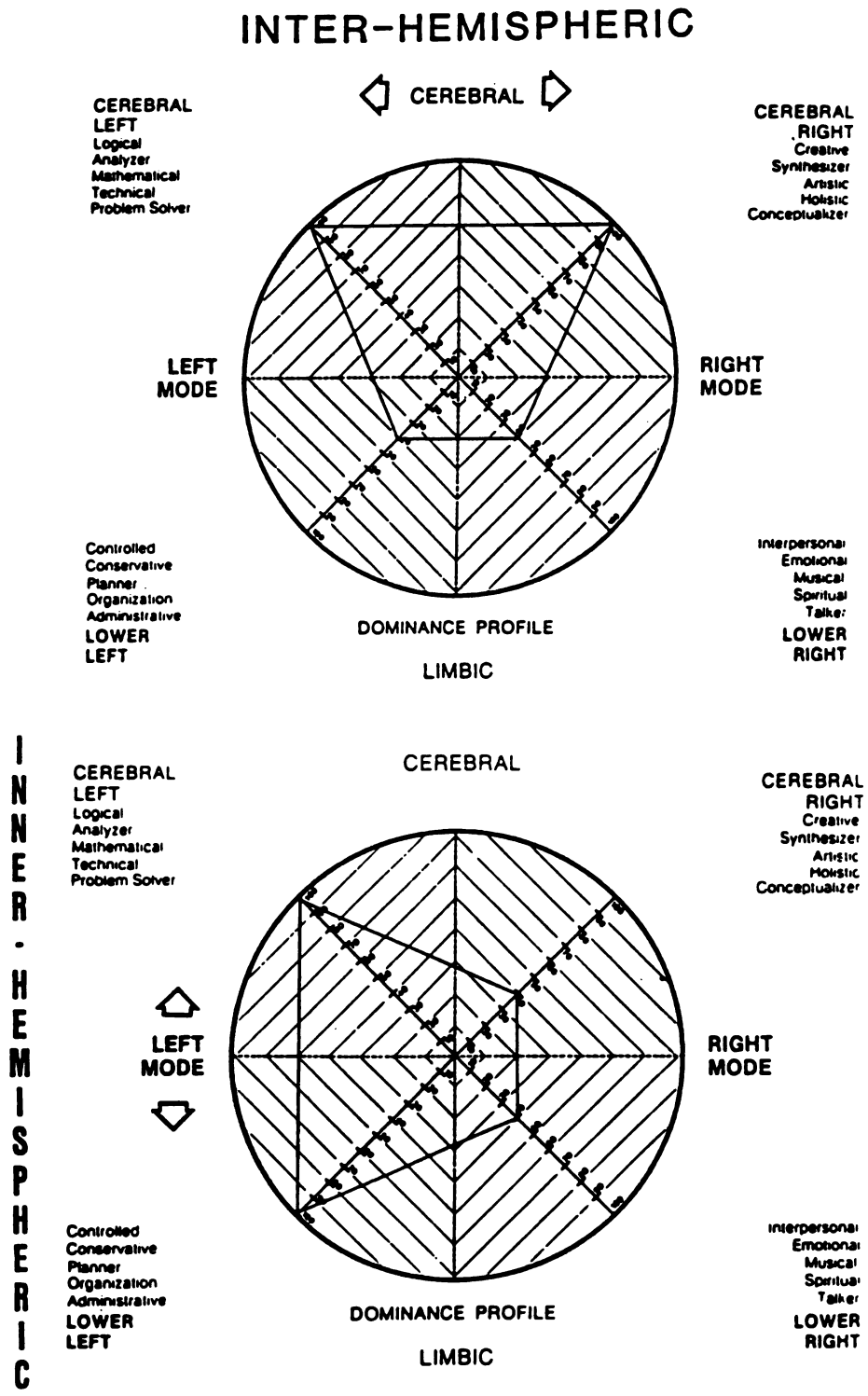


FIGURE 8: INTER- AND INNER-HEMISPHERIC INTERACTIONS

interactions *inter-* and *inner-hemispheric dominance* (See Figure 8 on the preceding page). When dominance patterns demonstrate preference for quadrants across the two hemispheres (left and right), the interaction is known as "inter-hemispheric". When the patterns show preference for quadrants on the same hemisphere, the interaction is called "inner-hemispheric". This movement between hemispheres is grounded in the repulsion/attraction portion of the Fourfold Theory. Table V describes the frequency distributions and percentages of these interactions in the total study population. In studies of chief executive officers', Herrmann has called attention to the multi-dominant nature of top

TABLE V

HEMISPHERIC INTERACTIONS OF THE STUDY POPULATION
N=232

	CHIEFS GROUP		ACADEMIC GROUP		FINANCE GROUP	
NATURE OF INTERACTION	#	%	#	%	#	%
Attraction Interaction						
Left inner-hemispheric	76	52	16	39	34	76
Right inner-hemispheric	29	20	14	34	3	7
Cerebral inter-hemispheric	16	11	2	5	5	11
Limbic inter-hemispheric	3	2	4	10	1	2
Repulsion Interaction						
Left limbic/right cerebral	13	9	2	5	0	0
Right limbic/left cerebral	0	0	1	2.5	1	2
Single Dominance						
Left	1	1	0	0	1	2
Right	3	2	1	2.5	0	0
Whole Brain (four quadrants)	5	3	1	2.5	0	0

executives and the ease with which they move from inner- to inter-hemispheric processing. The nature of their work requires an ability to understand and to be able to communicate with and to people of all dominances, as well as address organizational needs and problem-solving from several points of view.

In all three major groups (Chiefs, Academics and Finance Administrators), the most frequent interaction was the left inner-hemispheric dominance with Chiefs having 76 occurrences (52 percent), Academics, 16 (39 percent), and Finance administrators, 34 (76 percent). The second most frequent interaction was the right inner-hemispheric dominance for two groups: Chiefs with 29 occurrences (20 percent), and Academics with 14 (34 percent). The second most frequent interaction for Finance administrators was the cerebral inter-hemispheric dominance, five occurrences (11 percent).

Demonstrative of the Fourfold model, the left cerebral and right limbic interaction had only two occurrences in the entire population (.8 percent); the other diagonal interaction between left limbic and right cerebral quadrants occurred 15 times (six percent) in the entire population, and most frequently in the Chiefs group, 13 times (nine percent). In the final analysis, the Dominance Profile Code data clearly demonstrates that chief educational administrators, as well as the current pool of candidates for these executive positions, are characterized by a style predominantly left-brained in orientation.

Right/Left and Cerebral/Limbic Dominance Raw Scores

A second analysis of brain dominance was conducted by using the HBDI left/right and cerebral/limbic dominance raw scores. These scores indicate the degree of dominance between the left (analyzing, logical) and right (synthesizing, conceptual) hemispheres, and the cerebral (abstract) and limbic (concrete) processing of the individual's world. The numbers in these raw scores (for example, R/L (right/left): 120/57 or C/L (cerebral/limbic): 43/117) correspond to the degree of brain dominance of the respective hemisphere or cerebral/limbic level.

Any score in the 50 and above range is considered to be meaningful. Once a score moves into areas beyond 100, the individual begins to be committed to that quadrant's manner of mental processing more than would be indicated in a score below 100. The R/L: 120/57 example above does *not* mean that a person is exceptionally logical and controlled, and lacking in interpersonal and conceptual skills; rather, any score beyond fifty indicates that the individual has access to those specialized mental processes, but may not utilize them as frequently as above 100. Herrmann's research (1985) has demonstrated that high scores (beyond 100) indicate that an individual most often expresses him/herself in mental processes and resulting behaviors typical of that particular hemisphere or cerebral/limbic level.

Table VI shows comparisons of the means, range and standard deviation of the Chief Administrator population;

brain dominance in raw scores is represented by group means for the left versus right hemispheres. Four of the six groups have left dominance scores of 100 or more; the other two groups are in the 90's. Superintendents of educational service institutions--Intermediate school districts and the State department of education (N=40)--have, as a group, the highest mean for left-brain dominance. Their mean score (112.93) exceeds the mean score for the total group (105.97). The nature of the work inherent in services

TABLE VI

MEANS FOR LEFT/RIGHT BRAIN DOMINANCE SCORES
OF CHIEF EDUCATIONAL ADMINISTRATORS IN MICHIGAN, 1987
STUDY GROUP N = 146

GROUP	N=	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
4-YEAR HIGHER ED PRESIDENTS	7				
Left hemisphere		103.29	18.80	83	140
Right hemisphere		97.00	17.05	77	124
2-YEAR HIGHER ED PRESIDENTS	12				
Left hemisphere		99.00	22.68	70	130
Right hemisphere		100.33	25.35	67	138
K-12 5000+ SUPERINTENDENTS	33				
Left hemisphere		100.12	24.09	54	148
Right hemisphere		95.76	23.15	44	151
K-12 4999- SUPERINTENDENTS	47				
Left hemisphere		108.45	20.04	55	154
Right hemisphere		89.40	20.79	45	55
ISD SUPERINTENDENTS	40				
Left hemisphere		112.93	17.56	82	150
Right hemisphere		84.00	21.33	42	133
WOMEN SUPERINTENDENTS	7				
Left hemisphere		91.71	21.36	70	132
Right hemisphere		105.57	21.28	65	129
TOTAL GROUP:	146				
Left hemisphere		105.97	21.22	54	154
Right hemisphere		91.40	22.31	42	151

provided by Intermediate School District organizations to school districts would encompass analytical, technical, problem-solving and planning/administering activities. Most homogeneous to the total group mean are the four-year higher education presidents (N=7) had a mean left score of 103.29 (18.80 standard deviation [SD]) closest to the total group mean. Two-year higher education presidents (N=12) had a mean of 99.00 (22.68 SD), school superintendents of larger (5000+) school systems (N=33), a mean of 100.12 (24.09 SD), while school superintendents of smaller districts (N=47) of varying size had a mean of 108.45 (20.04 SD).

Two-year higher education presidents had the highest right-brain mean score, 100.33 (25.35 SD), and four-year presidents were second highest with a mean score of 97.00 (17.05 SD) in contrast to a total group mean of 93.30. Educational service (ISD) superintendents had the lowest right dominance mean (84.00; 21.33 SD); 5000+ superintendents exhibited a mean of 95.76 (23.15 SD), while smaller district superintendents (4999-) had 89.40 (20.79 SD).

From these data it appears that two-year presidents tend to differ more among themselves, as shown by the largest standard deviation (25.35 SD). The higher education groups are small in number and therefore make statistical tests for significance impossible. In the analysis of the mean raw scores, ISD superintendents, as a group, have a greater tendency to be more left-brain dominant than do any of the other chief administrator groups: A difference of 28.93

points between their mean left and right-brain scores tilts in favor of a left-brain style. Two-year presidents exhibit only a 1.33 point difference in mean score between left and right dominance, suggesting a greater tendency for more balanced or whole-brain thinking.

All groups show considerable variance within groups with standard deviations for left-brain dominance ranging from ISD superintendents with 17.56 SD to 24.09 SD for 5000+ superintendents. A similar range is present for right-brain dominance: Two-year presidents exhibit the greatest variance with 25.35 SD and four-year presidents, the lowest with 17.05 SD. Again, the small numbers in higher education groups limit statistical testing.

The total group mean scores for Cerebral/Limbic (abstract/concrete mental processes) dominance, reported in Table VII, show a similar strong balance of Left/Right means: Left mean (L:), 104.77; Right mean (R:), 93.30; Cerebral mean (C:), 103.46; and Limbic mean (LM:), 94.98. The group with the highest cerebral dominance is the two-year presidents with a mean of 113.17 (10.47 SD), and second, the 5000+ superintendents, with 104.39 (15.78 SD). The only mean below 100 for cerebral processing was the four-year presidents, with 97.29 (9.29 SD). Only one group, four-year presidents, demonstrated a limbic dominance with a six point difference in favor of limbic processing (C: 97.286 versus LM: 103.000). All other groups exhibit differences which

TABLE VII

MEANS FOR CEREBRAL/LIMBIC BRAIN DOMINANCE SCORES
OF CHIEF EDUCATIONAL ADMINISTRATORS IN MICHIGAN, 1987
STUDY GROUP N = 146

GROUP	N=	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
4-YEAR HIGHER ED PRESIDENTS	7				
Cerebral level		97.29	9.29	81	111
Limbic level		103.00	16.33	83	122
2-YEAR HIGHER ED PRESIDENTS	12				
Cerebral level		113.17	10.47	90	127
Limbic level		86.17	8.67	77	107
K-12 5000+ SUPERINTENDENTS	33				
Cerebral level		104.39	15.78	77	130
Limbic level		93.39	20.04	57	132
K-12 4999- SUPERINTENDENTS	47				
Cerebral level		100.77	14.15	70	130
Limbic level		97.09	17.18	60	135
ISD SUPERINTENDENTS	40				
Cerebral level		101.68	12.55	77	130
Limbic level		95.25	13.89	68	123
WOMEN SUPERINTENDENTS	7				
Cerebral level		90.57	12.49	74	108
Limbic level		106.71	19.52	80	138
TOTAL GROUP:	146				
Cerebral level		102.20	14.14	70	130
Limbic level		95.60	16.92	57	138

indicate cerebral preferences, and are listed here in descending order of difference: Two-year presidents, 27 points; 5000+ superintendents, 11 points; ISD superintendents and superintendents of smaller districts, both with six points.

In professional training workshops, individuals are helped to recognize meaningful differences in the raw dominance scores when there is a difference of 20 points between the two R/L or C/LM scores. Table VIII reports the frequency distribution and percentages of dominance scores

for the total Chief administrator group. Fifty percent of the total population had balanced cerebral/limbic scores (less than 20 points difference). Forty-four percent of the chief population were left dominant, while 35 percent were balanced in left and right processing.

TABLE VIII

FREQUENCY DISTRIBUTIONS AND PERCENTAGES OF BRAIN DOMINANCE RAW SCORES RELATIVE WEIGHTINGS (DIFFERENCE OF 20 POINTS BETWEEN R/L OR C/L
CHIEF EDUCATIONAL ADMINISTRATORS
6 LEVELS N = 146

LEFT/RIGHT WEIGHTINGS	freq-uency	%	CEREBRAL/LIMBIC WEIGHTINGS	freq-uency	%
Left			Cerebral		
0 to +20	29	.20	0 to +20	41	.28
+21 to +40	21	.14	+21 to +40	26	.18
+41 to +60	20	.14	+41 to +60	12	.08
+61 to +80	14	.10	+61 to +80	8	.05
+81 to +100	6	.04	+81 to +100	0	0
+101 to +120	3	.02	+101 to +120	0	0
Right			Limbic		
0 to -20	22	.15	0 to -20	32	.22
-21 to -40	19	.13	-21 to -40	18	.12
-41 to -60	6	.04	-41 to -60	8	.05
-61 to -80	3	.02	-61 to -80	1	.01
-81 to -100	3	.02	-81 to -100	0	0
-101 to -120	0	0	-101 to -120	0	0
SUMMARY RIGHT/LEFT:			SUMMARY CEREBRAL/LIMBIC:		
Balanced:	51	.35	Balanced:	73	.50
Left Dominant:	64	.44	Left Dominant:	46	.32
Right Dominant:	31	.21	Right Dominant:	27	.18

Final analysis of the Dominance Raw Scores reveals a more precisely stated weighting of brain dominance than the Profile Codes, and continues to demonstrate that Chief administrators are characterized by a predominantly left-brained style.

Scaled Scores for the Four Brain Dominance Quadrants

The four Scaled Scores--Left Cerebral, Left Limbic, Right Limbic, and Right Cerebral--provide the numeric quantities that form the Profile Codes. These continuous variables have been analyzed by computing group means and standard deviations for each of the four quadrants. These data, along with the range, were plotted on circular graphs and resulted in a visual representation of the "degree of tilt" for comparison with each of the administrator groups. MANOVAs were conducted between all administrator groups in the study, as well as between three educational level groups of chief, academic, and finance administrators, in order to test for significant differences.

CHIEF EDUCATIONAL ADMINISTRATORS

Figure 9 exhibits the composite graphs of scaled scores for higher education chiefs. The four-year presidents (N=7) are represented by a whole brain profile (1111)--all four quadrants are in the "prefer" range of 67 to 100+. The strongest quadrant for this group is the limbic left with a group mean of 84.14 (22.18 SD), focusing on administrative, organizational, conservative, planning, and controlling processes. The visual depiction also demonstrates the

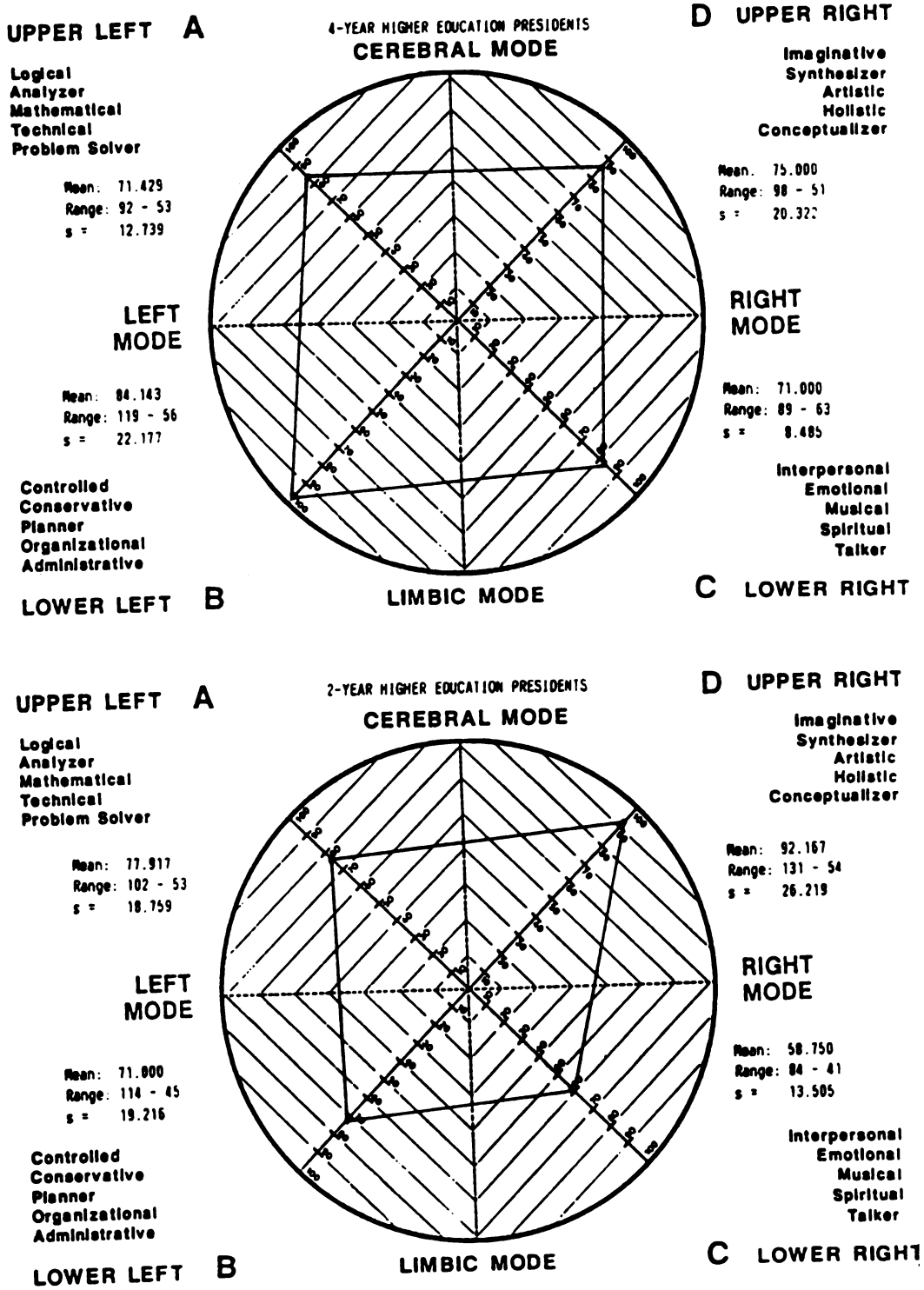
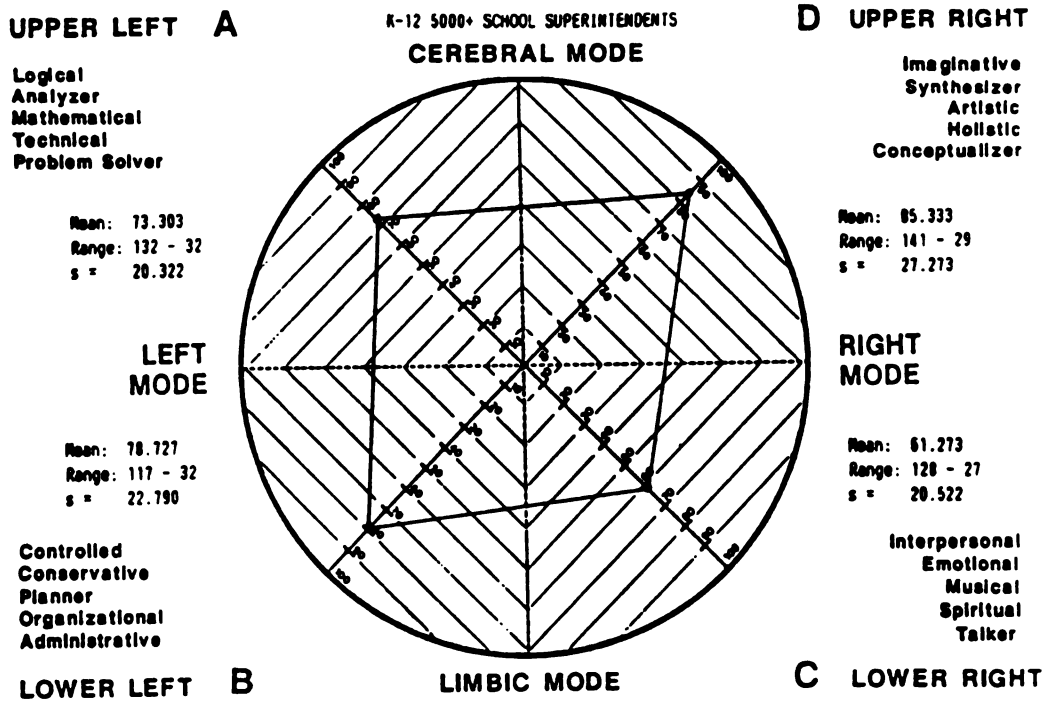


FIGURE 9: COMPOSITE SCALED SCORES FOR HIGHER EDUCATION PRESIDENTS

weighting toward limbic dominance as reported earlier in the raw dominance scores (C:97.29; LM: 103:00), the highest limbic score in the chief study group. The two-year presidents (N=12) are triple dominant (1121), with the highest group mean being in the right cerebral quadrant, 92.17 (26.22 SD). This group had the highest cerebral (C: 113.17) and highest right (R: 100.33 dominance means of this chief group. The score in the cerebral right quadrant reflects strong usage of conceptual, synthesizing, holistic, and imaginative processes.

Figure 10 exhibits the composite profile of scaled scores for K-12 superintendents. These two groups reflect different conditions of complexity: superintendents of districts of 5000+ (1121) have the complexities of structure and constituency groups; superintendents of the out-of-formula group (2111) contend with complexities of funding stability and constituency groups. Both groups are triple dominant, with the least preferred quadrant being the one dealing with interpersonal and intergroup processes: the group mean of 5000+ superintendents (N=33) is 61.27 (20.52 SD), and that of superintendents of smaller districts (N=47) is 60.32 (14.80 SD). This quadrant also reflected the lowest group means for higher education presidents (4-year: 71.00; 2-year: 58.75).

The most dominant quadrant for 5000+ superintendents is the right cerebral (85.33; 27.27 SD), representing conceptualizing, synthesizing, holistic and imaginative approaches;



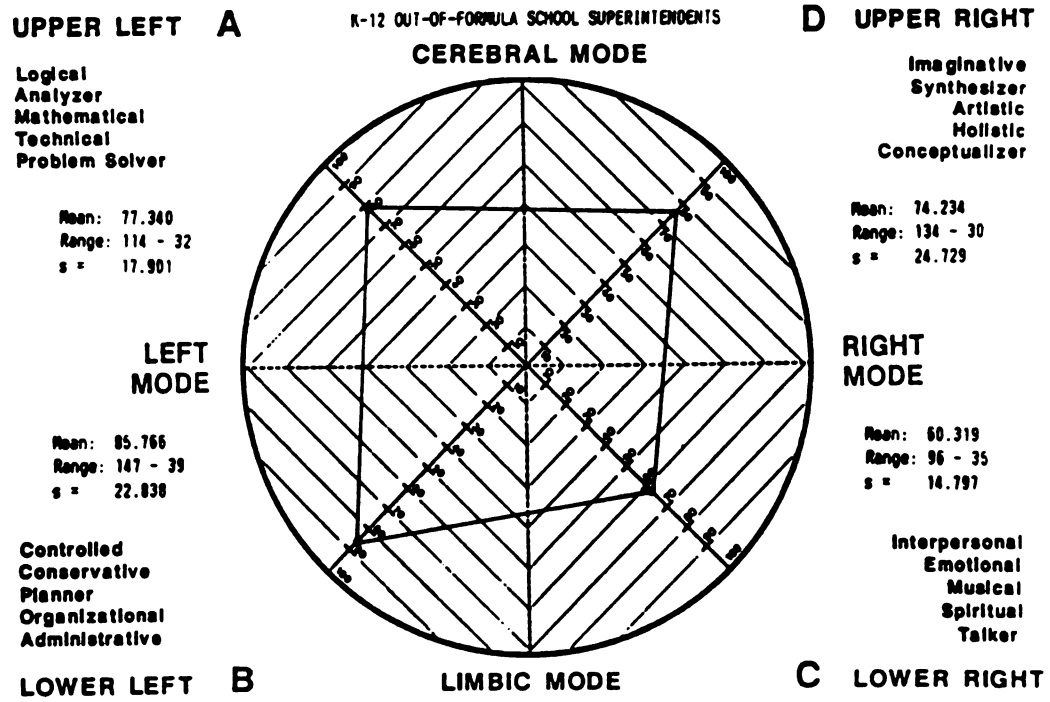
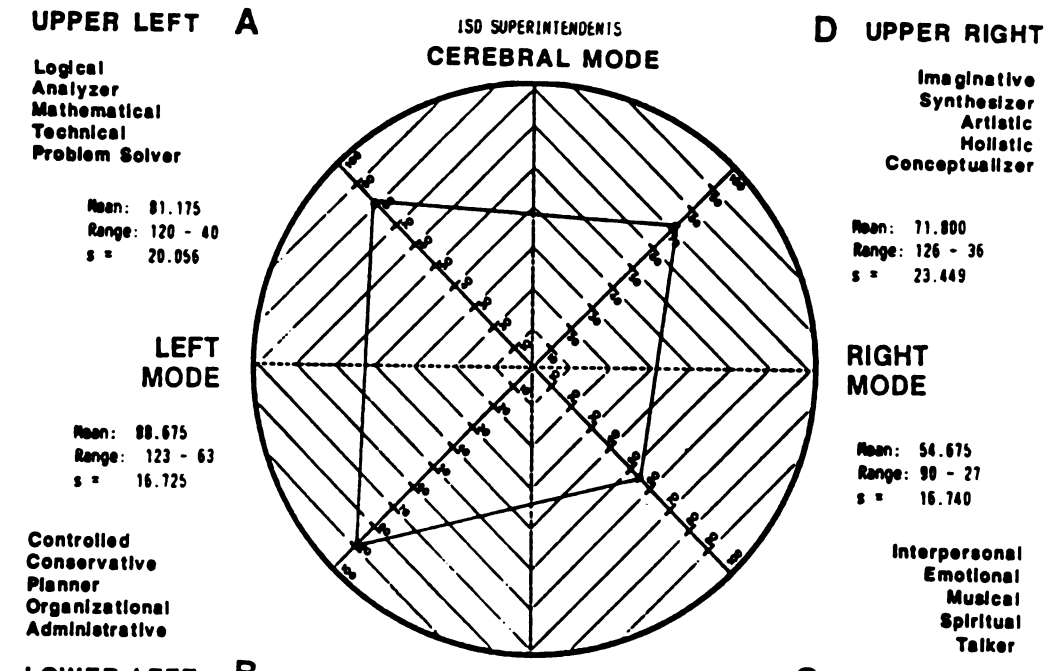


FIGURE 10: COMPOSITE SCALED SCORES FOR K-12 SUPERINTENDENTS

the 4999- superintendents are most dominant in the limbic left quadrant (85.76; 22.84 SD), utilizing planning, administering, controlling, and organizing approaches to work. Both groups exhibit cerebral dominance (5000+: 104.39; 4999-: 100.76), though the degree of difference between cerebral and limbic is not dramatic, and is influenced by the interaction present in triple dominance.

Figure 11 displays the profile patterns of educational service superintendents (N=40) and women superintendents (N=7). Though the size of the women's study population is not statistically reliable, it is worth examining for tendencies to compare with a recent Herrmann study of women chief executives.

The ISD superintendents' profile indicates triple dominance (1121), with the least preferred quadrant being the right limbic (54.68), low use of interpersonal, verbal, and intuitive processes. The group mean for the most preferred quadrant was 88.68 in the left limbic, a high preference for organizing, administering, planning, and controlling. Of the total chief study group, these superintendents had the highest left dominance mean score, 112.93. The standard deviation (17.56 SD) for this left dominance score indicated a tighter spread of scores within that group than any of the others. As with the other groups, the cerebral/limbic dominance is fairly balanced, with the strong left limbic quadrant (88.68; 16.73 SD) offsetting the lower mean in the



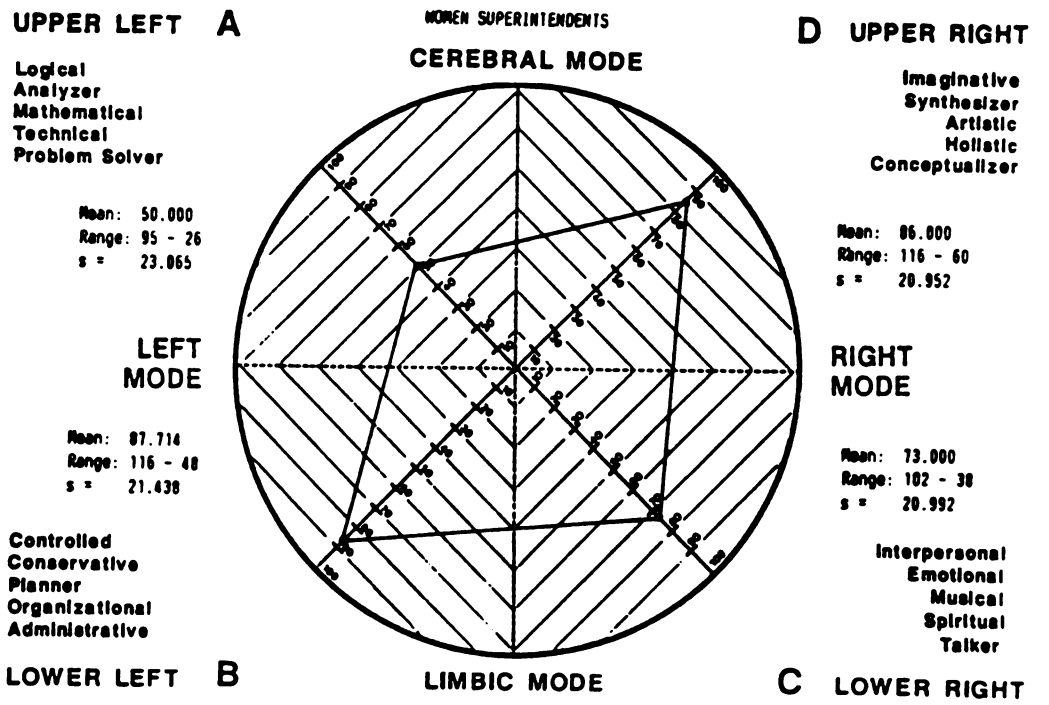


FIGURE 11: COMPOSITE SCALED SCORES FOR ISD AND WOMEN SUPERINTENDENTS

right limbic quadrant (54.68; 16.74 SD), the standard deviations indicating similar spreads in scores.

The women superintendent group exhibits a much different "tilt" of dominance profile than the other five groups. They too are triple dominant (2111), but with the dominance being in the right hemisphere (L: 91.71; R: 105.57). In this group there are two quadrant means which can be seen as highest: left limbic (87.71; 21.44 SD) and right cerebral (86.00; 20.95 SD). In the repulsion/attraction concept of the Fourfold model, this diagonal dominance interaction is remarkable because of the mental forces it puts in conflict: the controlling, conservative, and safe-keeping needs of the left limbic quadrant typically interacts with the imaginative, intuitive, risk-taking preferences of the right cerebral quadrant--the planful, step-by-step approach must struggle with a desire to rely on hunches when solving organizational problems. This combination of dominance interaction may be a source of internal stress for this particular group of chiefs. Of all the groups, the women have the strongest mean score for the right limbic, interpersonal quadrant (73.00).

Twenty Questions is one section of the HBDI that is used as a supplementary look at an individual's safekeeping and risk-taking tendencies. The left mode of thinking would represent a safekeeping tendency with its strengths in planning, analyzing logically, controlling and judging. The right mode of thinking represents the risk-taking tendency

through its use of intuition, speculating on the over-all picture, and the use of seemingly irrelevant material in solving problems. The questions in this section represent "right" or "left" value laden issues, intended to obtain further information on preferences for creative/intuitive/risk-taking approaches versus ordered/disciplined/safe-keeping approaches to problem-solving. In the total group of Chief administrators 60 percent scored a preference for safe-keeping; 18 percent, for risk-taking; and 22 percent for a balanced approach.

MANOVA tests were conducted on the five chief groups of chief administrators. Table IX reports that the null hypo

TABLE IX

MANOVA TESTS OF SIGNIFICANCE FOR CHIEF ADMINISTRATOR GROUP
N = 146

MULTIVARIATE TEST USING WILKS LAMBDA

Source of Variation	F	Hypothesis DF	Error DF	Significance F
Chief Groups	.90339	20.00	398.94	.583

UNIVARIATE TEST FOR THE CHIEF GROUPS WITH (5,123) D.F.

Variable	Hypothesis MS	Error MS	F	Significance F
SSLC	275.69443	383.00892	.71981	.610
SSLL	280.37346	457.78818	.61245	.691
SSRL	262.91061	286.22465	.91855	.471
SSRC	600.60089	615.12038	.97640	.435

thesis was supported at the <.05 level with no significant differences between the study groups. Herrmann's research has demonstrated repeatedly that persons are attracted into professional/vocational clusters according to brain dominance patterns; these clusters take on "tribal" likenesses.

Mintzberg (1976) noted that typically, individuals will gravitate toward occupations that offer an opportunity for that person to perform in his or her area of mental preference, thus providing the opportunity to utilize competencies. Herrmann (1986) has noted that over time, occupations have tended to standardize the work elements involved in the performance of those occupational tasks, and therefore, it is natural that people gravitate toward the kinds of job opportunities "that allow them to use their preferred modes of knowing in ways that contribute to their success and fulfillment" (p. 20). In most cases this provides for similar dominance profiles to "cluster" together in work settings, and in professions and trade groups.

Table X reports the top eight Key Descriptors of the Chief Administrator group, organized in descending order according to the frequency with which they appeared within each group. Clusters are apparent. "Logical" was the most frequently occurring key descriptor in all five groups. "Rational", "Holistic", and "Analytical" also appeared as key descriptors in all five. All but holistic are left cerebral indicators. "Controlled", "Intuitive," and "Verbal" were the next most frequently occurring descriptors. The * indicates

TABLE X

KEY DESCRIPTORS REFLECTING LEFT AND RIGHT HEMISPHERE DOMINANCE
CHIEF EDUCATIONAL ADMINISTRATORS -- 5 INSTITUTIONAL LEVELS
N = 139 excluding women superintendents

4-YR HI ED		2-YR HI ED		K-12 5000+		K-12 OF		ISD	
N=7		N=13		N=33		N=47		N=40	
1. Logical	LC	1. Logical	LC	1. Logical	LC	1. Logical	LC	1. Logical	LC
2. Rational*	LC	2. Holistic	RC	2. Holistic*	RC	2. Holistic*	RC	2. Rational*	LC
3. Holistic	RC	3. Analytical	LC	3. Rational	LC	3. Rational	LC	3. Controlled	LL
4. Verbal	RL,RC	4. Intuitive	RL,RC	4. Intuitive	RL,RC	4. Analytical	LC	4. Holistic	RC
5. Controlled	LL	5. Synthesizer*	RC	5. Analytical	LC	5. Controlled	LL	5. Analytical	LC
6. Intuitive	RL,RC	6. Rational	LC	6. Verbal	RL,RC	6. Verbal	RL,RC	6. Verbal	RL,RC
7. Analytical	LC	7. Creative	RC	7. Creative	RC	7. Intuitive	RL,RC	7. Conservative	LL
8. Dominant	LL	8. Controlled	LL	8. Synthesizer	RC	8. Synthesizer	RC	8. Factual	LC
						8. Conservative	LL		

Less frequently selected key descriptors were: musical, sequential, detailed, emotional, spatial, critical, artist mathematical, symbolic, quantitative, reader, and simultaneous.

Explanation: The letters in parenthesis indicate the quadrant tilt of the descriptor.
* Indicates the number one key descriptor selected in the group.

the most frequent indicator of "number one" key descriptor: "Rational" was selected "first" descriptor for four-year presidents and ISD superintendents; "Holistic" was first for the two K-12 superintendent groups. Two-year presidents indicated most frequently that "Synthesizer" was their first descriptor, fitting the primary mean of their right cerebral scaled score.

TOP LEVEL ADMINISTRATORS

The most ready candidates for Chief Educational Administrator positions are those persons who occupy top level positions in the organization. These positions typically have focused responsibilities for finance, personnel, maintenance, or academics/curriculum. Schein (1985) has observed that the persons who move into these top level positions are often there because they are attracted to the content of the work--the opportunities to demonstrate and develop their areas of expertise. In his Career Anchor model, these persons would be identified as having Technical/Functional Competence Anchors. Technically-anchored persons find the work *intrinsically meaningful*. Other individuals are in these positions because they enjoy the challenge of integrating the efforts of others, and tying together different functions in an organization; these persons are identified as having Managerial Competence Career Anchors.

The HBDI was developed primarily as a management development tool for helping General Electric scientists and engineers--predominantly technically-anchored persons--to better understand themselves as managers in the organization, integrators of multi functions, and to increase their effectiveness. The reason this study incorporated a secondary study group was to begin to get a picture not only of the existing chief administrator population, but also those who may aspire to these positions, so as to get a broader understanding of the brain dominance patterns as they relate to professional development.

ACADEMIC ADMINISTRATORS

Figure 12 exhibits the composite profiles of academics administrators from three organizational levels--all three indicate triple dominance group profiles. Two of the composites--four-year academic officers and K-12 5000+ superintendents in the curriculum area--demonstrate stronger right limbic means than all the chief groups except four-year presidents (81.80; 71.24; and 71.00 respectfully) which would indicate greater mobilization of interpersonal, verbal, and intuitive processes by the academic administrators in these two types of institutions.

Four-year academics officers (N=5) reveal a triple dominance pattern (2111), with the left limbic quadrant mean (86.20; 9.01 SD) highest. This group demonstrates visually a dominance in the inter-hemispheric limbic area, and is

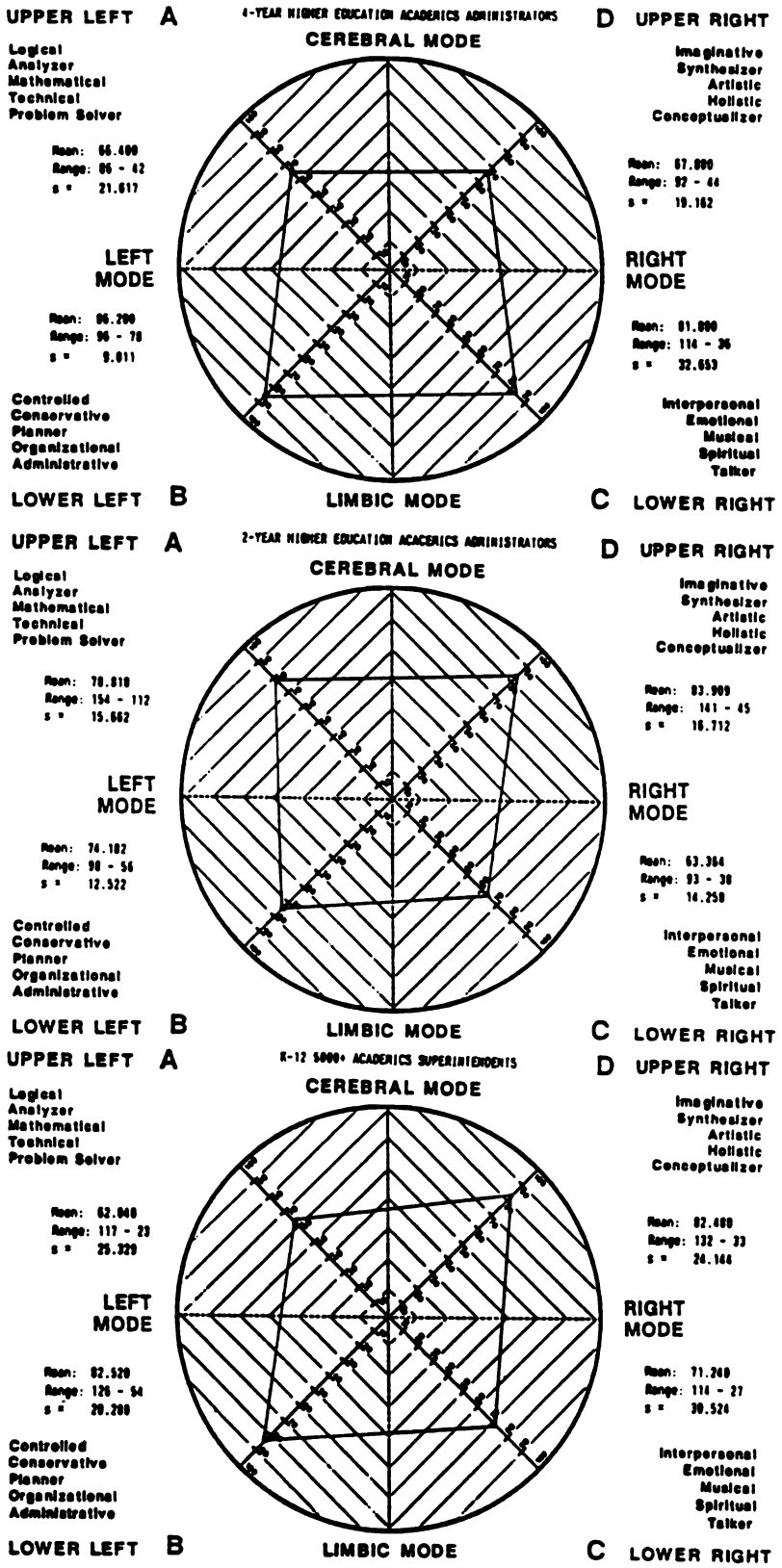


FIGURE 12: COMPOSITE SCALED SCORES FOR ACADEMIC ADMINSTRATORS

supported by the group raw limbic dominance mean (111.80; 20.43 SD), not unlike the four-year presidents.

The composite profile of academic assistant superintendents (N=25) is similar in shape to the chiefs. In addition,to the previously noted strength in the right limbic quadrant (71.24; 30.52 SD compared to the chiefs' 61.27; 20.52 SD), the profile shows a corresponding decrease in the left cerebral quadrant (62.04; 25.33 SD) compared to the chiefs' 73.30; 20.32 SD)--less use of facts, analysis and technical information. The Assistants also exhibit a higher organizing, controlling left limbic mean (82.52; 20.28 SD), compared to the chiefs' mean (78.72; 22.79 SD) in the same quadrant.

The two-year academic officers (N=11), like two-year presidents, are strongest in the right cerebral quadrant (83.91; 16.71). They show a stronger mean in the right limbic, interpersonal quadrant (63.36; 14.26 SD) than the two-year presidents, and a somewhat increased mean in the organizing, administrative left limbic quadrant (82.52; 20.28 SD compared to the presidents' 71.00; 19.22 SD).

In the *Twenty Questions* section of the HBDI, Academic Administrators indicated more balance between safe-keeping and risk-taking preferences than chief executive administrators: 60 percent of the four-year academic officers chose safe-keeping to 40 percent for risk-taking; 48 percent K-12 5000+ curriculum administrators made safe-keeping choices, with 28 percent, risk-taking, and 26 percent

balanced in their choice-making. Two-year academic officers reversed the tendencies of all other groups with 64 percent choosing risk-taking and 36 percent, safe-keeping.

Table XI reports the frequency tabulations of the eight Key Descriptors for this Academics group. All three groups indicated "Logical", "Holistic", "Verbal", and "Analytical" as key personal descriptors. The two higher education groups included "Controlled", while the two-year higher education and assistant superintendents included "Creative," "Rational"

TABLE XI

KEY DESCRIPTORS REFLECTING LEFT AND RIGHT HEMISPHERE DOMINANCE
TOP LEVEL ACADEMICS ADMINISTRATORS -- 3 INSTITUTIONAL LEVELS
N = 41

4-YR HI ED		2-YR HI ED		K-12 5000+	
N=5		N=11		N=25	
1. Logical	LC	1. Rational	LC	1. Rational	LC
Detailed	LL	2. Logical	LC	2. Logical	LC
3. Holistic	RC	3. Analytical	LC	3. Holistic*	RC
Verbal	LL,RL	Holistic*	RC	4. Verbal	LL,RL
Analytical	LC	5. Verbal	LL,RC	5. Analytical	LC
Controlled	RL,RC	6. Synthesizer	RC	6. Reader	LL,RL
		Controlled	LL	7. Synthesizer	RC
		Creative	RC	8. Creative	RC
				Intuitive	RL,RC

Less frequently selected key descriptors were: musical, emotional, artistic, spiritual, mathematical, symbolic, and simultaneous.

Explanation: The letters in parenthesis indicate the quadrant tilt of the of the descriptor.
Two words for the same sequential number indicates the same frequency.
*Indicates the number one key descriptor selected in the group. Not enough cases for tabulate a number one for the 4-year higher education academics officers.

and "Synthesizer". Both higher education groups indicated that the number one descriptor was "Holistic". The small number in the four-year higher education group made this tabulation process difficult; indications were present, however. All three groups included at least a 50-50 balance in descriptors between left and right-hemisphere, and an increase in descriptors that imply working with people versus working with structure.

Examination of the Academics Administrators' Scaled Scores and Key Descriptors demonstrated that this group is characterized by a style which requires strong organizational and administrative skills (left limbic quadrant) and interpersonal, verbal, and intuitive skills for facilitating the human resources toward goal achievement in the organization (right limbic quadrant). They must also have a view of the over-all program and how the pieces are synthesized together (right cerebral quadrant). Given the analysis of this data, this style is congruent with the focus of their work responsibilities of managing and synthesizing the academic programs and instructional personnel in their institutions.

FINANCE ADMINISTRATORS

The composite profiles of the Finance administrators at three different institutional levels (Figure 13) are clearly left dominant, with the most preferred quadrant being the mathematical, quantitative, and logical left cerebral. All three levels show a dramatic increase above the group mean

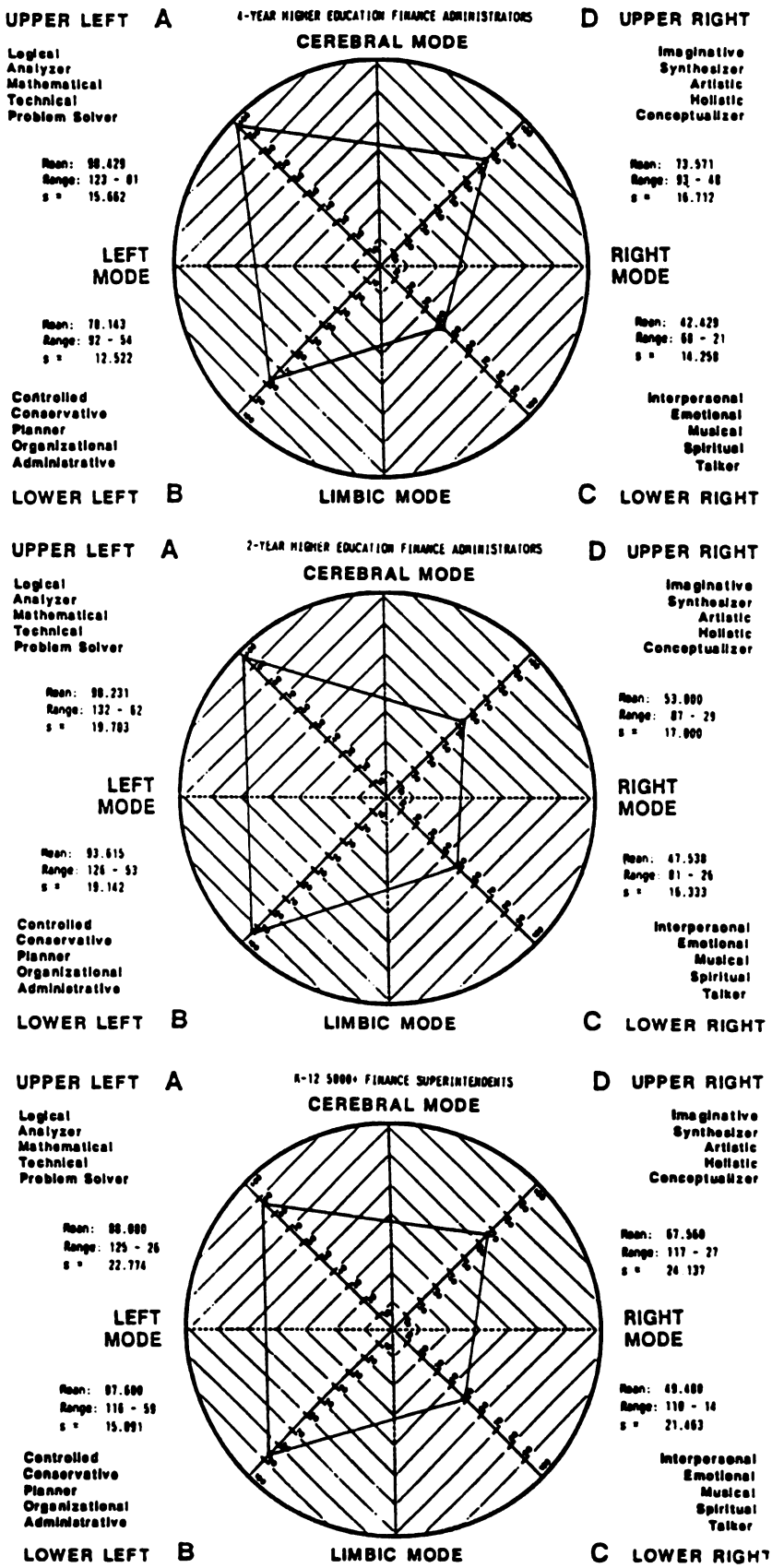


FIGURE 13: COMPOSITE SCALED SCORES FOR FINANCE ADMINSTRATORS

scores of the chief administrators of these levels: Four-year higher education presidents' 71.43; 12.74 SD contrasted with the finance officers' 98.43; 15.66 SD; Two-year higher education presidents' 77.92; 18.76 SD contrasted with the finance officers' 98.23; 19.70 SD and K-12 5000+ superintendents' 73.30; 20.32 SD contrasted with the finance assistant superintendents' 87.60; 22.77 SD.

This group of top level administrators are also much lower in their interpersonal and intuitive right limbic, or "people", quadrant: Four-year--42.43; Two-year--47.54; and K-12--49.48. All of these scores are considered in the "low use" level of mobilizing these mental processes. The lowest right limbic mean score for any of the other groups is the ISD superintendents with 54.675; 16.740 SD. All three levels of finance administrators exhibit high preference for the organized, controlled, and conservative left limbic quadrant.

As would be expected, the Finance Administrators demonstrated the least inclination to take risks in the *Twenty Questions* portion of the HBDI. Four-year and two-year finance officers indicated a 57 percent and 69 percent preference respectively for safe-keeping; 5000+ K-12 finance administrators indicated 52 percent. Stronger balance between the two was also reflected in this group 29 percent (four-year), 23 percent (two-year), and 32 percent (K-12).

Tabulation of the Key Descriptors (Table XII) gave further evidence of the strong left cerebral dominance of this administrator group. All descriptors except one,

"Holistic", are found in the left quadrants; left cerebral descriptors were indicated more than 60 percent of the time in all three groups.

TABLE XII

KEY DESCRIPTORS REFLECTING LEFT AND RIGHT HEMISPHERE DOMINANC
TOP LEVEL FINANCE ADMINISTRATORS -- 3 INSTITUTIONAL LEVELS
N = 45

4-YR HI ED		2-YR HI ED		K-12 5000+	
N=7		N=13		N=25	
1. Analytical*	LC	1. Logical*	LC	1. Logical	LC
Rational	LC	2. Rational	LC	2. Rational	LC
3. Logical	LC	3. Conservative	LL	3. Analytical	LC
4. Mathematical	LC	4. Controlled	LL	4. Conservative	LL
Dominant	LL	5. Factual	LC	5. Holistic*	RC
Factual	LC	6. Analytical	LC	6. Controlled	LL
		7. Detailed	LL	7. Mathematical	LC
		8. Mathematical	LC	8. Quantitative	LC
					RL,RC

Less frequently selected key descriptors were: synthesizer, emotional, artistic, spatial, spiritual, and symbolic.

Explanation: The letters in parenthesis indicate the quadrant tilt of the of the descriptor.
Two words for the same sequential number indicates the same frequency.
*Indicates the number one key descriptor selected in the group.

Analysis of the Scaled Scores data of Finance Administrators clearly demonstrates that this group which has focused responsibilities for the financial health of their institutions are characterized by brain dominance patterns which are congruent with the needs to track the mathematical/ quantitative dealings of the organization, as well as to organize the mechanics for doing business. The left cerebral and left limbic quadrants are heavily mobilized.

MANOVA tests for significant differences between chiefs and top level administrators were run for each of the scaled scores on three different institutional levels. The results of these tests are reported in Table XIII. The null hypothesis was supported; there were no significant differences between top level administrators and chief administrators at the >.05 level of significance.

TABLE XIII

MANOVA TESTS OF SIGNIFICANCE FOR THREE ADMINISTRATOR GROUPS
CHIEF ADMINISTRATORS--ACADEMIC AND FINANCE ADMINISTRATORS

N = 138

MULTIVARIATE TEST USING WILKS LAMBDA

Source of Variation	F	Hypothesis DF	Error DF	Significance F
Type of Administrator by Institution Level	1.23314	12.00	336.300	.259

UNIVARIATE TEST FOR TYPE BY LEVEL WITH (3,130) D.F.

Variable	Hypothesis MS	Error MS	F	Significance F
SSLC	135.90784	455.44365	.29841	.826
SSLL	777.45247	367.43557	2.11589	.101
SSRL	523.90797	482.03850	1.08686	.357
SSRC	1343.33246	590.43561	2.27515	.083

Small study populations in the higher education administrators no doubt have placed serious limitations on the tests for significant differences. The analysis of the Scaled Scores, Key Descriptors, and Twenty Questions have provided the following observations.

Four-year higher education presidents and top level administrators: Differences were found in the left cerebral and right limbic quadrants; the previous analysis of the data has demonstrated that finance officers are more dominant (98.43) in left cerebral processing than chiefs (71.49). Finance officers also showed the least preference (42.43) for the right limbic quadrants, where both the chiefs (71.00) and academics officers (81.80) showed a preference for this quadrant.

Two-year higher education presidents and top level administrators: Differences were found in the left cerebral, left limbic, and right cerebral quadrants. Again, finance officers were markedly higher (98.231 in group mean in the quantitative, analytic left cerebral quadrant. Presidents (92.167) and academics officers (83.909) were highest of the synthesizing, conceptualizing quadrant. The finance officers' group means were markedly dominant (93.615) in the organizing, controlled left limbic quadrant, compared to presidents (71.000) and academics officers (74.182).

K-12 public school superintendents and top level administrators: Differences were found in the left cerebral, right limbic and right cerebral quadrants. Finance officers

had a group mean (88.080) and key descriptors which demonstrate primary dominance in the left cerebral quadrant compared with chiefs (73.303) and academics (62.040). In the right limbic--"people"--quadrant, academics superintendents (71.240, "low prefer") and chiefs (61.273, "high use") were higher than finance administrators (49.480, "low use"). Academics administrators had a "high prefer" mean (82.480) in right cerebral, compared with the "low prefers" of the chiefs (71.800) finance administrators (67.560).

INDEPENDENT VARIABLES

Herrmann notes in his studies (1985) that cultural differences have an impact on brain dominance--30 percent of individual differences are due to nature; 70 percent, to culture. Some of his studies in the general population indicate that there are more differences between people living in rural and urban environments than there are between people in different countries in those same environments (1985). However, similar occupations seem to have similar brain dominance patterns, no matter what country they are in.

This study chose three "cultural" variables and examined them for any significant differences in brain dominance patterns, using the Scaled Scores of the Chief Administrator population.

The discrete variable, *Community Size*, was tabulated by chief groups into four categories: Urban (1), Suburban (2), Small City (3), and Rural (4). Figure 14 reports the frequencies and percentages of the Chief Administrator

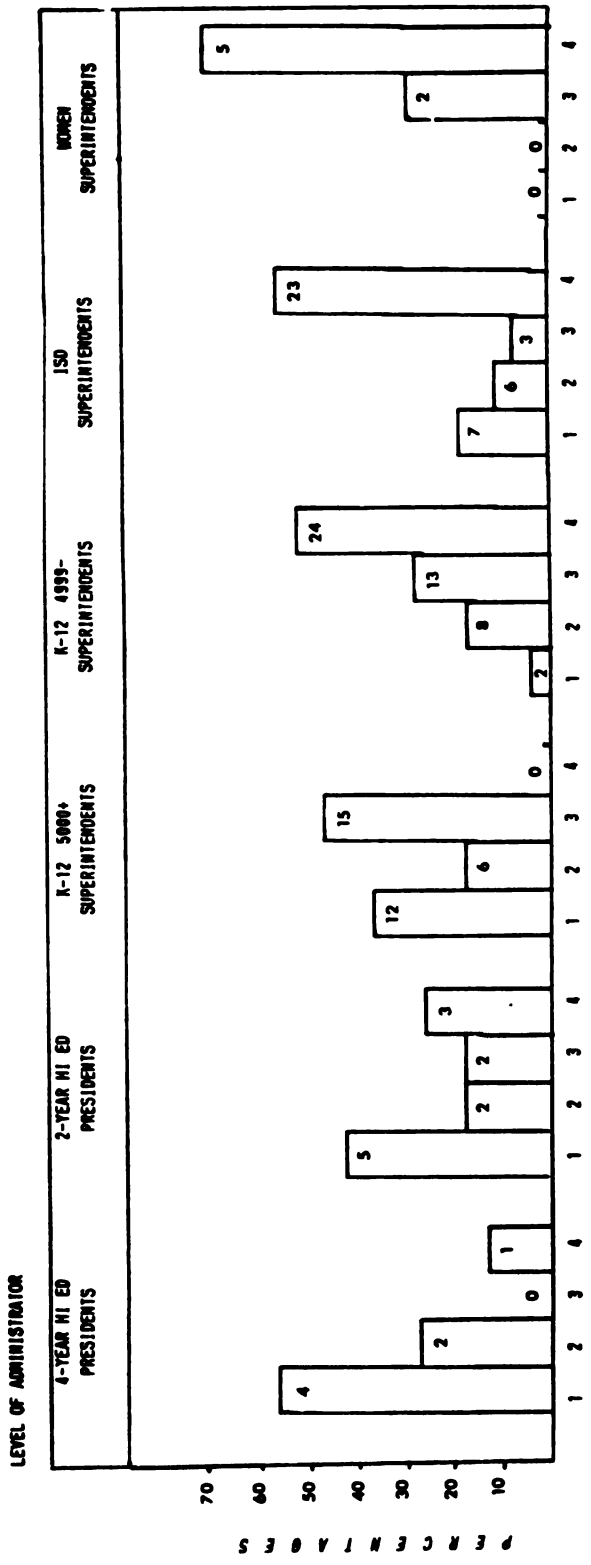


FIGURE 14: FREQUENCIES AND PERCENTAGES OF COMMUNITY TYPES BY STUDY GROUPS

population (N=146) in six groups. As is probably true in most states, the highest percentage of higher education institutions and large school districts are located in urban and suburban centers. The majority of school districts and ISDs are located in small cities or rural areas. Of the total study population, 21 percent are located in urban areas, 17 percent in suburban areas, 24 percent in small cities, and 38 percent in rural areas.

The continuous variable, *Years of Experience*, is reported in Table XIV which indicates that the experience of the chief administrator study group ranges from one to 32 years. One quarter of the study population are "short termers" with five or fewer years; another view would

TABLE XIV

FREQUENCIES AND PERCENTAGES OF YEARS OF CHIEF ADMINISTATIVE EXPERIENCE--BY GROUP

YEARS BY INCREMENTS OF 5	4-YR HI ED	2-YEAR HI ED	K-12 5000+	K-12	OF	ISD	WOMEN	TOTALS	%
5	1	7	10	12	2	5	37	25
10	3	2	7	15	7	1	35	24
15	3	2	9	9	9	1	33	23
20			4	9	9		22	15
25			1	1	6		10	7
30+					5		7	5
					2		2	1
TOTALS:	7	12	30	47	40	7	146	100

indicate that 23 percent of the population have from 11 to 15 years experience; another, 13 percent have 20 or more years. The other quarter of the population have from six to 10 years.

The second continuous variable, *Size of Institutions*, is reported in Table XV. Forty-two percent of the study population manage educational enterprises which are below 5000+ student count; 29 percent, from 5001 up to 10,000; 14 percent 10,001 to 20,499; and 15 percent, 20,500 and above.

TABLE XV

FREQUENCY DISTRIBUTION OF SIZE OF INSTITUTIONS SERVED BY STUDY GROUPS
CHIEF ADMINISTRATORS -- 5 LEVELS -- N = 139

SIZE	4-YR HI ED	4-YR HI ED	K-12 5000+	K-12 OF	ISD	WOMEN	TOTALS	%
0 TO 2500		3		30	0	4	37	25
TO 5,000		3		17	3	2	25	17
TO 7,500	2	1	15		3	1	22	15
TO 10,000	1		9		11		21	14
TO 12,500	1	2	4		2		9	6
TO 15,000	1	1	1		4		7	5
TO 17,500	1		2		2		5	3
TO 20,500		1	1		2		4	3
TO 40,000		2	1		8		11	8
TO 60,000					1		1	1
ABOVE	1				4		5	3
RANGE:	5300 - 120,000	1200 - 31,500	5000 - 32,600	200 - 4999	3500 - 200,000	180- 7000	146	100%

MANOVA tests were conducted on chief administrators and these three variables at the <.05 level of significance. The analysis was not an attempt to predict or explore a causal relationship, but rather to examine if there were any significant differences. MANOVA results are reported in Table XVI. The null hypothesis was supported; there were no significant differences in brain dominance patterns in relationship with these three variables. This would indicate that the strongest "cultural" influences on the brain dominance of educational administrators are to be found in the content and activities of their work.

SUMMARY

This chapter presented the data collected from a study of the brain dominance styles of chief and top level educational administrators at specified institutional levels in the State of Michigan. The results were analyzed administrator groups at institutional levels. The findings will be discussed in Chapter 5.

TABLE XVI

MANOVA TESTS OF SIGNIFICANCE FOR RELATIONSHIP OF VARIABLES
--YEARS EXPERIENCE, INSTITUTIONAL SIZE, AND COMMUNITY TYPE--
TO BRAIN DOMINANCE PATTERNS OF CHIEF ADMINISTRATORS

N = 146

MULTIVARIATE TEST USING WILKS LAMBDA

Source of Variation	F	Hypothesis DF	Error DF	Significance F
Covariates (Years Experience and Size)	.74213	8.000	240	.654
Interaction (Type by Chief)	.77842	44.000	461.04	.846
Type of Community (Urban, Suburban, Small City, Rural)	.55200	12.000	317.78	.879

UNIVARIATE TEST FOR THE COVARIATES WITH (2,123) D.F.

Variable	Hypothesis MS	Error MS	F	Significance F
SSLC	104.90400	383.00892	.27389	.761
SSLL	115.00989	457.78818	.25123	.778
SSRL	90.19059	286.22465	.31510	.730
SSRC	73.60450	615.12038	.11966	.887

UNIVARIATE TEST FOR TYPE BY CHIEF WITH (11,123) D.F.

Variable	Hypothesis MS	Error MS	F	Significance F
SSLC	168.81653	383.00892	.44076	.935
SSLL	262.59230	457.78818	.57361	.847
SSRL	172.15112	286.22465	.60145	.825
SSRC	587.94740	615.12038	.95582	.490

UNIVARIATE TEST FOR COMMUNITY TYPE WITH (3,123) D.F.

Variable	Hypothesis MS	Error MS	F	Significance F
SSLC	312.49536	383.00892	.81590	.487
SSLL	97.97385	457.78818	.21402	.877
SSRL	216.60554	286.22465	.75677	.520
SSRC	245.02974	615.12038	.39834	.754

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

The purpose of this chapter is fourfold. First, a concise summary of the context, purpose, and structure of the study is presented. Second, the major findings and their implications are summarized and discussed in light of a theoretical framework gleaned from the survey of the literature. Third, the conclusions from the study and implications for practice are discussed. Fourth, recommendations for further study are enumerated and elaborated. In conclusion, a synthesizing statement is offered to capture the substance and scope of what has been attempted in this study.

SUMMARY

The purpose of this study was to initiate some brain dominance research of chief educational administrators to determine what personal and work elements are key in the present leadership, and what cognitive processes might be encouraged to promote a balance of technical, intuitive, and conceptual skills. During the past three decades American educational institutions have moved from rapid growth and abundant resources to population declines and eroding financial funding. The turbulent 1960s caused many a practicing chief administrator, or one aspiring to an

executive position, to think seriously about the loss of power, prestige, clarity, and certainty in the positions of president and superintendent. Though the times are not as turbulent in the 1980s, rapid changes are in evidence, and more appear on the horizon--for personnel management, curriculum development, dwindling funding resources, and a confusing variety of teaching technologies. The major guiding question for this study was to discover what characterizes the cognitive styles of these persons who seek out the challenges inherent in American educational organizations; are they equipped to confront ambiguity, uncertainty, complexity/diversity, and paradox in addition to maintaining a workable and effective educational structure? Leadership and management research indicates that there are characteristics unique to the work of chief executives which are strongly related to their preferences for certain kinds of mental processing. Brain dominance studies (Herrmann, 1985) have demonstrated that people gravitate toward occupations that offer an opportunity for each to perform in his or her area of mental preference, therefore utilizing "competencies" in successfully reaching personal and organizational goals.

This descriptive study surveyed voluntary subjects who are public college/university presidents, school superintendents, and top level administrators in academic and finance areas of responsibility, to determine what personal and work elements are key components in the present educational leadership in the State of Michigan. Responses to a

paper-and-pencil self survey, the Herrmann Brain Dominance Instrument, classified subjects on the basis of their dominance scores in each of four Brain Profile quadrants. This instrument was originally developed by synthesizing the processes of mental functioning from the brain research literature, rather than from psychological concepts, in order to provide a model that gave focus to learning and professional development. In addition, the present version of the HBDI was perfected through the design and implementation of management development training.

Several independent variables were analyzed to determine if these seemed important relative to brain dominance in educational executives. These independent variables were: community type, size of educational institution, and the number of years of executive experience.

The study surveyed a population of 232 subjects, and returns were distributed as follows. The primary study group of chief administrators included seven four-year higher education presidents, 12 two-year higher education presidents, two groups of K-12 school superintendents (one group from larger districts had 33 participants, and the second group from districts of varying sizes had 47), the state superintendent of public instruction, 40 superintendents from intermediate school districts (educational services organizations throughout the state), and seven women superintendents. The secondary study group of top level administrators included five four-year higher education academic and

seven finance officers, 11 two-year higher education academic and 13 finance officers, and 25 each, curriculum and finance assistant superintendents.

The questions in this study were explored by analyzing brain dominance Profile Codes, Right/Left and Cerebral/ Limbic Dominance Raw Scores, and Scaled Scores for each of the Four Quadrants in the Herrmann model, as well as Key Descriptors and Twenty Questions, on the basis of frequency distributions, measures of central tendency and variability, and MANOVA tests.

A review of current literature related to brain research, brain hemisphere dominance, and management and leadership processes was conducted as a basis for the research. Findings in this descriptive study are examined in light of a composite theoretical framework which arose out of the literature survey. As people accumulate different kinds of work experience, acquire more realistic pictures of themselves and their career goals, and discover what is really important to them in life's journey, their self-concepts become clearer and more articulated. They know what they do best and where they want to do it. Schein's Career Anchors concept (1985) reflects patterns that emerge in an individual's conscious reasons for educational, work, and career decisions. These anchors are congruent with the brain dominance patterns identified by Herrmann and his colleagues (1985). The findings from this study give a description of the strengths and limitations of executive competencies of

Michigan's educational leadership, and suggest implications for professional development opportunities.

FINDINGS AND IMPLICATIONS

The there were four major findings drawn from the analysis of the data: 1) Chief administrators in education in the State of Michigan are characterized by a style predominantly left-brained in orientation; 2) Top level administrators with responsibility for academic and financial affairs are characterized by a style congruent with the content of their work and the demands of the organization on their competencies; 3) A cognitive style which utilizes interpersonal, intuitive, and emotional skills, and depends on the ability to express ideas, was the least preferred quadrant of all the groups studied; 4) Chief administrators demonstrated a strong preference for the safe-keeping, maintaining elements of work, compared to the risk-taking, conceptualizing activities which lead organizations toward and through change.

This section will focus on each finding, summarizing the analysis of data, and discussing implications from the literature survey for professional development possibilities.

Left Brain Dominance

Examination of Dominance Profile Codes, Dominance Raw Scores, Key Descriptors, and the Scaled Scores in the four Brain Profile quadrants consistently confirmed the fact that Chief administrators in the State of Michigan, as a professional group, prefer left-mode thinking styles. In the

examination of data, patterns of dominance did differ between different institutional types, though the varying and small numbers in some of the groups studied did not allow significant differences to be tested.

Because of the analytic, abstract, and conceptual nature of the educational content of higher education, and the loosely-coupled organizational structure encouraged by an assumption of professional autonomy, this researcher had anticipated higher education presidents to exhibit more cerebral, inter-hemispheric dominance across the left and right hemispheres. *Four-year presidents* as a group exhibited a composite whole-brain profile, with dominance in the limbic inter-hemispheric area. Presidents with limbic dominance may, in fact, be required and employed during periods of retrenchment, as well as in times of a conservative political climate for obtaining funding resources.

The four-year institutions are typically stable in their academic programs, having established worthy reputations. There are fewer opportunities in the 1980s for creating new programs in response to society's needs. In fact, since the late 1970s, Michigan has been cutting and consolidating professional and technical training programs across the state because of diminishing financial resources. These conditions would require the mobilization of the conservative, planful, and organizing processes of the left limbic quadrant and the interpersonal, intuitive processes of the right limbic for dealing with the "people pressures" inherent in change

efforts. This is not to say that the strengths of the other two quadrants are lessened--this group's composite profile is whole-brain, demonstrating degrees of preference in all four quadrants.

Two-year higher education presidents demonstrated triple dominance with high preference for the right cerebral quadrant--the visioning, creative, conceptualizing, and synthesizing processes. This is congruent with the practice of community colleges providing leadership in implementing responsive programs in technical areas where they are located. Academic programs have a very practical, immediately-useful nature, and must always be updated. The strong preference for left inner-hemispheric processing ensures the flexibility for the vision to be made a reality. The dominance pattern of this group is congruent with their major institutional goals.

The two groups of *K-12 school superintendents* exhibited left-dominant profiles which are in line with previous studies; however, in this study they demonstrated triple dominance more often.

Two previous studies of educational administrators demonstrated the strong preference for left dominance. Coulson's study (1984), which compared the brain dominance patterns of CEOs with those of superintendents, suggested that educational executives must respond to several factors that require him/her to be safe-keeping and analytical: the conservative political climate of school boards, the

criticisms and increased demands from the consumers of public education and their parents, and the increasing limited budgets funded by public monies (p. 24). Coulson's data exhibited group dominance scores for superintendents of LD 116 and RD 87.04, compared to LD 104.76 and RD 93.3 of this study.

Norris (1984) studied the brain dominance of three groups of school administrators, including superintendents, in relationship to a concept of creative leadership. A key component of this study was to examine the degree of use in the conceptualizing abilities of the right cerebral quadrant. In this study, the superintendents exhibited LD 128.11 and RD 77.89. Norris' findings supported her premise that the managerial qualities of educational administrators "appear to evolve from a custodial environment rather than one infused with a creative spirit" (p.14). The K-12 superintendent population of this study indicates movement toward a more balanced, whole brain pattern (LD: 104.284 and RD: 92.581).

Figure 15 presents the comparative profiles of the three chief administrative studies. The composite profile of the present study is almost matched to the placement of the other two studies in the right limbic quadrant. It appears that as a professional group, chief educational administrators do not utilize all the interpersonal and intuitive information that is naturally available to them in the content of every day activity. (The significance of this observation will be

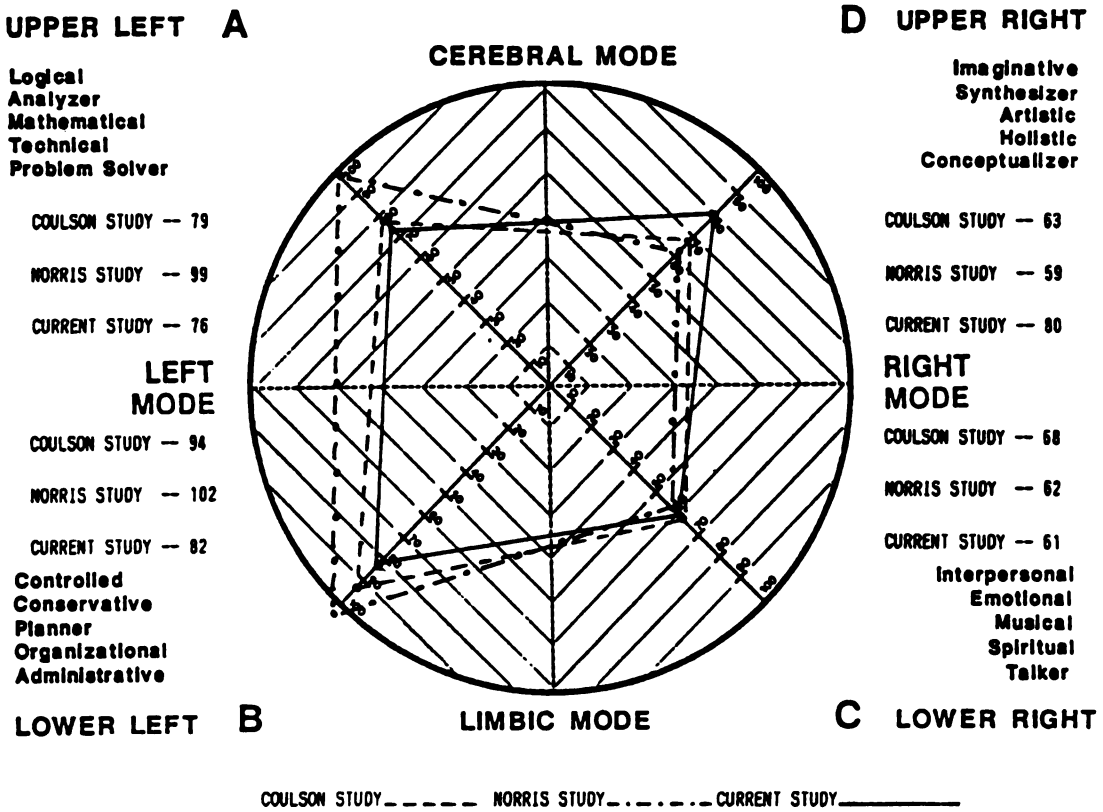


FIGURE 15: COMPARATIVE PROFILES OF THREE BRAIN DOMINANCE STUDIES OF SCHOOL SUPERINTENDENTS

discussed in detail in the third finding.) The increase in the right cerebral quadrant is due to the dominance patterns of two-year higher education presidents (RC: 92.174) and K-12 5000+ superintendents who also exhibit this as their primary quadrant (RC: 85.333). This is a change in the increase of dominance for the conceptualizing quadrant compared to those from the previous studies: Coulson--RC: 67.87, Norris--RC: 62.

All three groups in the Norris study had 1122 as their most prevalent dominance code. In this present study of

chief administrators, the three most frequent codes in the Superintendent group were 1122 (37 percent of that group), 1112 (19 percent), and 1111 (12 percent)--demonstrating multiple dominance. Herrmann (1986) recently completed a study of brain dominance in a group of 44 women executives, who were owners, presidents, CEO's or Chairman of the Board of their own companies, or some medium to large corporations. The overall average of this group was a 2111, with total scale scores of 55 in left cerebral, 69 in left limbic, 85 in right limbic, and 89 in right cerebral. These averages correspond to the women superintendents in the present study: their composite profile code was 2111, with scores of 50 in left cerebral, 88 in left limbic, 73 in right limbic, and 86 in right cerebral. The impact of public demands from competing constituency groups on the educational enterprise, versus business and industry, probably account for the stronger dominance in the left limbic quadrant.

Returning to the present study alone, the superintendents of the larger, more complex school districts showed a higher preference for right cerebral dominance; superintendents of the schools of varying smaller sizes, and specific funding concerns, exhibited higher preference in the organizing, planful, and controlled left limbic quadrant.

ISD superintendents also demonstrated triple dominance, but with a much more decided "tilt" to the left side. In Michigan these educational organizations exist to provide special education, technical training, professional

development, and testing and research resources to the school districts and residents in their geographical area of responsibility--usually by counties. The nature of work of these organizations requires strong emphasis on expertise and structure to insure quality programs and equal opportunity.

Of the 632 superintendent positions in the state, only eight *women superintendents* (two percent) are present in the executive ranks. They too are triple dominant, but decidedly right hemisphere in dominance. Of all the chief groups, they have the strongest dominance in the right limbic quadrant, the seat of interpersonal, intuitive, and verbal processes.

Implications from the Literature

The literature survey of leadership and management research indicates a clear concern for mental and behavioral flexibility in chief executives in order that they might respond appropriately and effectively to environmental demands, both internal and external to the organization. Such flexibility could be represented in multi-dominant brain profiles of chief executive officers in brain dominance studies (Coulson, 1984; Herrmann, 1985).

As early as 1955, Katz (1974) described the primary skills of the effective administrator in terms of three developable skills: technical, human, and conceptual. After nearly twenty years of research and consultation with executive leaders, Katz continued to support these primary skills with some modifications. Experience proved that administrators were being well prepared in the area of

technical skills in their professional training programs, and in some psychological models of human motivation and development.

Katz makes an urgent plea for the recognition of conceptual skill as a high priority in the training of administrators--to be able to strike a balance in recognizing and understanding conflicts within the organization, and to be able to trace their real and likely impact throughout as solutions are considered. Katz believes that the executive administrator must have the flexibility to change management style situationally in order to utilize these skills appropriately, moving back and forth between remedial, maintaining, and innovative roles (p. 102).

The Situational Leadership model of Hersey and Blanchard (1982) proposes moving about situationally through four styles: Directing, Coaching, Supporting, and Delegating. These four styles exhibit congruence with the Herrmann brain dominance model. Flexibility of style in situationally-determined instances is precisely how the human brain is structured to function--the corpus callosum provides instantaneous communication between the two hemispheres, and provides a "banquet" of choices. Professional development training programs need to encourage the use of theoretical models which would increase the ability to recognize systems/people in process and the intentionality of decisional and behavioral choices.

Bennis and Nanus (1985) underscore the importance of intentionality in a leader. Their research of 90 key leaders in the United States, including some college presidents, demonstrated that leaders are not born, but rather emerge when organizations face new problems and complexities that cannot be solved by unguided evolution. Leaders, they believe, are intentional about assuming responsibilities for reshaping organizational practices to adapt to changes; they build confidence and empower their employees to seek new ways of doing things; they overcome resistance to change by creating visions of the future that evoke confidence in and mastery of new organizational practices. They create a clear vision of a desired and achievable future state; they articulate the vision to followers through symbols and images that induce enthusiasm and commitment; they behave in congruent ways that hold self, as well as organizational members, to be accountable, predictable, and reliable--thereby, developing organizational trust; and they are continually learning and developing personal and professional skills. Weick (1982) examined the unique role of administration in loosely-coupled, educational systems. His conclusions encourage a need for administrators who are articulate and visionary leaders, and who pay attention to the "glue" of human resources that hold the enterprise together. Weick suggests that the key is "symbol management": a means of reminding people of central visions

and assisting them in applying these visions to their own activities. Symbols are

> "not trivial if they help people interpret what they are doing,...if they strengthen action by giving the person an understanding of what might be happening and what can be done next, if they link people who might otherwise feel isolated, if they give people ways to describe what they do that will evoke interest and approval from others, and if they give people answers to puzzles they encounter". (p. 676)

What Weick is describing here are the behaviors that arise from the full, dominant use of the right limbic and right cerebral quadrants.

The management and leadership literature repeats a common observation: American executive leadership is well trained and informed in the technical/analytic process of management. Less formalized attention has been given to the human and conceptual processes. This study population demonstrates these same observations: 1) the strengths of the majority of chief and top-level administrators are found in the technical, organizational quadrants of the left hemisphere; 2) the human, intergroup, and communication skills are found in the right limbic quadrant, and this is the least preferred quadrant of the study population; 3) the processes used for visioning, integrating, and thinking cross-functionally are found in the right cerebral quadrant. This quadrant was usually found secondary in degree of dominance to the left quadrants in most subjects.

Top Level Administrators Demonstrate Work-Congruent Patterns

Examination of the data from the top level administrator groups indicate that the brain dominance patterns do reflect the content of the work focus and responsibilities (the integrating of academic programs with instructional personnel, and the managing of finances). As would be expected from the technical demands of their work, finance officers were markedly left-dominant. Academics officers' profile patterns were more congruent with the chiefs of their same institutional level, with stronger dominance in the right limbic, "people" quadrant.

The most dramatic data was found in the finance administrators group. Group means of dominance and scaled scores indicated strong preferences for left hemisphere processing; the key descriptors were specifically heavy in the quantitative and analytical processes. The low "use" group means in the interpersonal and intuitive right limbic quadrant indicate that these administrators clearly prefer to use their technical expertise more than their human facilitation skills.

The academic officers, on the other hand, demonstrated much stronger preference for right limbic processing than the rest of the study population--with the exception of the women superintendents--as well as dominant mean scores in the left limbic area. Their organizational responsibilities call for

synthesizing the goals of the intstructional program with the professional and technical human resources available in their institutions.

Implications from the Literature

Edgar Schein (1985) has conducted research on the dynamics of career development in organizational chief executives for the past two decades. As a result of that work he has developed a group of eight "Career Anchors." Everyone differes in how they view their careers and working life; each person has a degree of each of the anchoring patterns, but one is always more dominant that the rest. One career anchor that applies specifically to top level management persons is Technical/Functional Competence (Schein, 1985,pp.40-42). This anchor attracts persons who build their sense of identity around the *content* of their work, the technical or functional area in which they are succeeding. They prefer to develop increasing skill in their area of expertise; they want to be specialists. Some technically or functionally anchored people have sufficient managerial talent to function at senior levels, but they clearly prefer the content of their work to the management of people.

Top level administrators who are interested in taking chief executive positions in educational institutions would be well advised to explore the role brain dominance plays in their choice of work. If they are intrigued by the complexity of interactions between the structure of the

organization, the people, and the organizational goals, and enjoy integrating and synthesizing the efforts of many persons for the achievement of organizational mission/goals, then the executive position will be a career match (Schein, 1985)--flexibility in mental processing is preferable. If perfection of expertise in financial or curriculum matters is more important, then utilizing the competencies in one or two brain dominance quadrants will lead to personal satisfaction and career success.

Least Preferred Quadrant

Of the total study population, nine of the twelve groups of administrators (75 percent) surveyed demonstrated group means that placed the right limbic quadrant as least preferred. This quadrant represents a cognitive style which utilizes interpersonal, intuitive, and emotional skills, and depends on the ability to express ideas. This same result has been noted in previous brain dominance studies (Coulson, 1984; Norris, 1984; Herrmann, 1985). This raises some major questions about some assumptions about why individuals are attracted to education as a career. It has been this reasearcher's experience in professional development training events that many individuals claim they go into education because of the opportunite to "help kids" or to "work with people".

Do we go into education because of the "kids", or is it for the job security that the educational institution offers? Do we decide "what's best for children", or is it

that we want to insure the stability of the structure? the status quo? Do we like working with people, or is it the professional autonomy that is unique to educational organizations that we seek? If it is people that draw us to education, why is that so many educational administrators demonstrate this quadrant as least preferred?

Is it because the people aspects of the educational environment have become decidedly adversarial in the past two decades? Is it the unionization of faculties? Is it the increasingly conservative boards of trustees that decide policy and hire the chief executives? Is it the lack of organizational trust as educational institutions move through stages of retrenchment? Is it the lack of attention paid to human resource development in administrative training professional development programs?

This researcher believes these questions must be addressed because education is a "people enterprise" on all levels; the skills/abilities for dealing effectively with people must be valued and expanded.

Implications from the Literature

Katz (1974) suggests that human skills for executives must be seen more clearly in terms of intragroup and intergroup processes--"intragroup skills are essential in lower and middle management roles, and intergroup skills become increasingly important in successively higher levels of management" (p. 101). This supports Herrmann's premise (1985) that the key to executive management in the year 2000

will be the ability to be a multi-dominant communicator--to listen to and facilitate the communication of all human segments of the organization.

In his extensive work-activity research on five executive subjects, including a school superintendent, Mintzberg (1976) observed that much of the executive's time is spent interacting on a personal basis with others. Verbal communication and interpersonal interaction were relational, simultaneous methods of acquiring information about the organization; little time was spent reading the more ordered and sequential memos and reports. These executives preferred meetings where they could engage in the "real-time exchange of information" (p. 54). This included reading facial expressions, tones of voice, and gestures which were evidence for the intuitive understandings of organizational processes and problems. Mintzberg's conclusions from his studies were that "truly outstanding managers are no doubt the ones who can couple effective right-hemispheric processes (human non-verbal cues, hunch, judgment, synthesis, etc.) with effective processes of the left (articulateness, logic, analysis, etc.) (p. 57).

Sensitive to the impact of change on organization effectiveness, Wortman (1982) addresses the need for executives to become adept in a participative approach to the management of their subordinates, and groups with competing interests. In the case of organizations with boards of directors, there is an urgent need for skills which

accommodate increased interaction with members who chose to have more and more influence on the analysis and formulation of organizational goals, and on the monitoring/evaluation of executive performance. Another dimension for utilizing the participative approach is critical in complex organizations which have management teams--a more collegial relationship will be primary. No one person will have the expertise to deal with all the aspects of the organization's interaction with change, and the maintenance of productive operational programs.

Fry and Pasmore (1983) point out the need for developing interpersonal abilities in such a way that one may enter a variety of groups, develop relationships within, and provide a leadership which develops group cohesiveness, teamwork, and trust. This requires *interdependent thinking and action*; too often dependent thinking is encouraged or assumed by most of our administration training/development programs. A valuing of brain dominance strengths will insure the exchange of information, creative problem solving, and organizational goal achievement. A carefully selected management team which understands and values heterogeneity insures the access of the organization to a "whole brain".

Safe-keeping versus Risk-taking

According to the brain research, and the Fourfold Theory of Brain Dominance, risk-taking is "housed" in the innovative, creative, integrating, and conceptualizing right cerebral quadrant; safe-keeping, in the controlled,

organized, detailed, and conservative left limbic quadrant. As reported in the first finding of this study, group means indicated strong dominance in the left limbic quadrants for all chief administrator groups; 2-year higher education presidents, women superintendents, and K-12 5000+ superintendents showed a primary dominance in the right cerebral quadrant. The twenty-questions portion of the HBDI survey clearly demonstrated a preference for safe-keeping attitudes toward problem-solving and decision-making activities in all groups studied.

Implications from the Literature

In his studies of top corporate management in all types of American organizations, Wortman's (1982) thesis is that top managers--executives--should think and act strategically (long range), whereas lower level managers must be more concerned with daily operations. His concern is that American executives typically act entirely too managerially--maintaining the status quo. He strongly urges that they develop and enhance the skills to inspire followers to accept change, and the skills to take initiative and risks. These skills are represented in the processes of the right hemisphere quadrants.

Zaleznik (1977), Burns (1978), and Bass (1985) developed the concepts of transactional and transformational leadership as they relate to the safe-keeping and risk-taking elements of facilitating organizations and individuals through changing times. Zaleznik's and Burns' evolving descriptions of

the transactional leader fit the mental processing of the left hemisphere; the transformational leader fits that of the right. Bass (1985) has taken care to point out that while conceptually distinct, transactional and transformational leadership are likely to be *displayed by the same individuals in different amounts and intensities* (p. xv)--a demonstration of the iterative, whole brain potential for executive leadership.

Another, more amorphous, issue is the development of the capability to create and think in alternative frames of reference so as to handle the ambiguities and complexities of changing organizations (Watzlawick, 1974; Adams, 1974; Schien, 1985). This capability is related to moving away from the left limbic safe-keeping mode and into the right cerebral risk-taking posture.

The management and leadership literature repeats a common observation: American executive leadership is well trained and informed in the technical/analytic process of management. Less formalized attention has been given to the human and conceptual processes. This study population demonstrates these same observations: 1) the strengths of the majority of chief and top-level administrators are found in the technical, organizational quadrants of the left hemisphere; 2) the human, intergroup, and communication

skills are found in the right limbic quadrant, and this is the least preferred quadrant of the study population; 3) the processes used for visioning, integrating, and thinking cross-functionally are found in the right cerebral quadrant. This quadrant was usually found secondary in degree of dominance to the left quadrants in most subjects.

Personal Development

Chief administrators are first of all individual persons with unique talents, skills, and motives; such individual uniqueness is especially visible in the study of brain dominance. The fact that dominance is not a static condition, but a constant, developing and interactive process is an important fact. Herrmann (1981) reported a longitudinal study which indicated that brain dominance characteristics of an individual can change as the result of an impactful learning experience. The study involved a group of people who experienced a one-year residency program in the area of interpersonal relations. They completed brain dominance surveys at the beginning, in the middle and the end of the intensive experience. In every case, there were measurable shifts in the brain dominance profiles of the individuals involved. A debriefing with these individuals indicated that the change in the brain dominance profile was clearly consistent with their experience during the learning program.

Extensive studies of profile patterns across the general population have revealed some "typical" profile descriptions. The most prevalent dominance profile code in this current

study was 1122. A person with this profile would frequently be technically oriented, effective at problem solving, and quite conservative, controlled and structured in thinking, but effective in planning, organizing, and administrative activities. In the secondary modes, this person would have interpersonal skills, be able to deal with emotions effectively, and be able to integrate, synthesize and think holistically. These conceptual and intuitive capabilities would be secondary, but quite functional when the individual is intentional. When approaching a problem, this individual would be more rational than emotional (Herrmann, 1985).

These are all positive attributes for the person who is drawn to executive positions. However, if that person is not aware of the source of individual differences--the brain--, then she/he is not inclined to make provisions for it in a constructive manner. A strong left dominance could encourage the assumption that "my way is everyone's way." The uniqueness issue is tremendously important, especially in communication.

When people think in the context of their dominance, they are not only talking in that context, but they are listening in that context. A good example of this would be a left brain person who doesn't think in metaphors and a right brain person who thinks primarily in metaphors. They have difficulty talking to each other and understanding the content of their interaction. Teachers and professors who do not aspire to administrative positions are often the very

people who teach content through the use of metaphor. They see organizations and tasks in terms of metaphor. Then the administrator comes along and sets in motion a logical, sequential plan that is supposed to make things better, assuming that it is clear, concise, understandable, and important to achieving effectiveness. This is the arena in which Bennis and Weick make their case for administration as "symbol" managers, and Schein (1985) as "culture" managers. Herrmann (1985) submits that a primary role of the future effective executive will be as "multi-dominant communicator."

A Prototype for Professional Development

In examining the literature, it is this researcher's opinion that the most useful model for assessing and developing executive competencies, through the increased mobilization of mental processes, is Schein's Managerial Competence Career Anchor (1985). Schein identifies three basic areas:

1) Analytical Competence is the ability, under great time pressure, to take incomplete information of unknown validity and convert that information into a clear problem statement that can be worked on. The crucial skills are identifying, analyzing, synthesizing, and stating problems in such a way that decisions can be made. The ability to think *cross-functionally and integratively* gives these individuals the skills to manage the process of decision-making in the organization as a whole.

2) Interpersonal and Intergroup Competence is the ability to influence, supervise, lead, manipulate, and control people at all levels of the organization *toward organizational goal achievement*. A concrete example of this competence area: The ability of executives to bring the right people together around the right problems, and then to create an interpersonal problem-solving climate that will elicit full exchange of information and full commitment from participants. Executives quickly learn that the complexity of organizational tasks is such that they simply cannot any longer make decisions by themselves. They are highly dependent on the information and insight of others, and must find ways of eliciting and utilizing the involvement of those others.

3) Emotional Competence is the capacity to be stimulated by emotional and interpersonal issues and crises rather than exhausted or debilitated by them; the capacity to bear high levels of responsibility without becoming paralyzed; and the ability to exercise power and make difficult decisions without experiencing guilt or shame. Schein believes that it is the essence of the executive's job to absorb the emotional strains of uncertainty and interpersonal conflict, and to accept responsibility for the nurturing of organizational trust. In his research, he has found that it is this aspect of the job that managerially-anchored persons increasingly seek, that excites them, that makes their jobs meaningful and rewarding (Schein, 1985, pp. 42-44).

These processes and behavioral responses are "housed" in the right limbic quadrant. Consistently, throughout this study population, this quadrant was least preferred. The degree of dominance in this quadrant was for most individuals in the USE category--available, but usually "cancelled out" or "put on hold" by a preferred left mode of processing. This usually occurs in situations where efficiency wins out over effectiveness.

Summary

As individual chief educational administrators, those individuals aspiring to executive positions, and those responsible for the content and structure of administrative training/teaching programs reflect on how they might provide practical and challenging professional development opportunities, both on and off the job, there may be value and richness in looking through the "lenses" of brain dominance for both a rationale and a plan.

CONCLUSIONS

Through every stage of this project, the researcher was aware of the personal nature of this descriptive study. Before discussing the conclusions, it is important to be clear that it was not the purpose to place value judgments on the thinking style preferences of any one group. Instead, the researcher perceived the data as a needs analysis for professional development, and not an indictment of any one style of thinking. There is a natural interdependence of functioning within the brain's structure. It follows that

the intuitive, holistic, and creative processes of the right hemisphere need the logical, analytical, and sequential processing of the left if the effective articulation and implementation of human endeavor is to take place.

In this final stage, it is apparent that conclusions have been drawn from two levels of the process--examination and analysis of the data, and the administration and scoring of the survey instrument. The primary focus for conclusions will be drawn from the first. However, the conclusions from the second are more intutitive in nature and less defensible in this left-hemisphere project; it is this researcher's belief that they are worth noting.

Left Hemisphere Conclusions

1. This study revealed that persons in executive level educational administration positions, or those who might aspire to them, are characterized by a brain dominance style which prefers the logical, analytic, organized and controlled processes of the left hemisphere. However, compared to previous studies, the data here indicate a strong presence of multiple dominance. In an effort to encourage this trend, the following conclusions might be considered:

a. All levels of the educational enterprise should begin to emphasize, understand, and value individual differences and developmental stages--the source of which can be found in the functioning of the human brain--in the planning, implementation, and content of their instructional programs. The educational establishment has a long tradition

of using individual differences for remedial or reward purposes (an analytic approach)--not for promoting the growth and development of *full* potential (a holistic approach).

b. Chief executives should be intentional about increasing their access to right hemisphere skills through personal and professional development experiences that emphasize right mode processes, in whole brain settings.

c. Boards of trustees should require that professional development experiences be related to the personal and organization development goals revealed in the evaluation process. (In the majority of cases, this probably implies a major change in the understanding and implementation of the executive evaluation process.)

2. The management/leadership literature indicates that most American organizations are experiencing dramatic change processes due to changes in technology, financial resources, and retrenchment of organizational structures, and the people who work in them. The literature suggests a need for executive leadership that is able to envision a reachable and desireable future state, and articulate the vision to the followers in ways that empower them to change.

a. Advanced programs in educational administration should include courses in organizational culture, strategic planning, and a more intentional consideration of normative and descriptive administrative theory--an integration of "what should be" and "what is". This addition should include

a focus on legitimizing the intuitive information that is constantly available in the organization environment, and its utilization for decision-making and problem-solving purposes.

b. Advanced programs in educational administration should provide increased, long-term experiences that train and develop executives to appreciate interdependent thinking, and to work in highly developed, heterogeneous groups.

c. Professional associations should seek out and present professional development experts and programs from other areas of the behavioral sciences which might have application to educational administration, and which are committed to giving results-oriented learning experiences to all participants. This means going beyond the "keynote speaker" concept which is in popular practice; this implies workshop settings for from one to several days.

Right-Hemisphere Conclusions

1. There is an indication that chief and top level administrators may assume that one must do everything well.

There was a section on the survey instrument which asks the individual to rate him/herself on the ability to use 16 different work elements. The respondent was limited to four choices in each category: (Work I do best, Work I do well, Work I do less well, Work I do least well, and Work about which I feel neutral.) The instruments that were returned but not included in the study were incorrect because the

individuals would not discriminate between these work elements. In most cases, they marked all the items either "best", "well", or "neutral".

a. There is a need to provide for more personal/ professional assessment and career development opportunities in advanced administration programs, or in professional associations' workshop calendars to legitimize and mobilize individual differences.

b. There needs to be more attention given to the dynamics of and strategies for team building in upper levels of educational administration.

2. In nearly all levels of the study groups, "Holistic" was selected as a Key Descriptor. In the process of scoring each instrument, it became apparent that the definition for holistic that many individuals were using had more to do with seeing the whole *structure*, rather than the whole *picture*.

The right cerebral concept of holistic implies being able to see beyond the existing structure/picture to the "what if's" and the "what might be's". Holism has been a popular concept in much of the media, and is being used more and more to describe situations which are bounded by a left-mode way of thinking.

Chief administrators must be encouraged to understand "holistic" as a first step in risk-taking considerations, rather than an explanation for safe-keeping.

RECOMMENDATIONS FOR FURTHER STUDY

This final section presents recommendations for future study in the area of the brain hemispere dominance of chief educational administrators. The first section considers refinements of the present study and the next suggests areas for future study.

Refinements of Present Study

1. The numbers of subjects need to be increased in the levels of higher education and women administrators in order that the statistical procedures could be used for more predictive purposes.

2. In order to increase the numbers of these groups, the population would have to be drawn from beyond state borders.

3. In order to increase the size of the study population, financial resources should be solicited. The mailing, printing and mainframe computer costs ended up being sizeable for this researcher.

Recommendations for Future Study

1. Subjects from private educational institutions could be included to determine if there are any signigicant differences between chief administrators in public and private settings.

2. Left hemisphere dominance of educational administrators has been confirmed by three studies. It could be useful to identify specific leadership and management work elements which are actually demanded of persons in chief administrator

positions and correlate them with the Herrmann Model. Discrepencies found between what is needed for effective administration and what exists (as gathered from qualitative studies) could suggest areas for curriculum concentration in departments of educational administration.

3. Create an *Action Research* project which would combine the study of practical problems faced by chief administrator with applications of the brain dominance theory to illuminate understanding of mental choices and behavioral responses. Such a project would help to specifically identify case studies which represent a range of intuitive, synthesizing, and holistic approaches to problem-solving to balance off the many logical, analytic, and quantitative case studies utilized in used in advanced training programs of educational administration.

A FINAL WORD

Brain research is regarded by some as a "suspect" field. Leadership studies have ranged from personal characteristics to cataclysmic circumstances, and everything in between. In the process of the literature survey, this researcher encountered a voice from nearly fifty years ago that echoed the need for integrating all mental processes in the Effective Executive:

> One can hardly contemplate the passing scene of civilized society without a sense that the need of balanced minds is real and that a superlative task is how socially to make mind more effective. That the increasing complexity of society and the elaboration of technique and

> organization now necessary will more and more require capacity for rigorous reasoning seems evident; but it is a super-structure necessitating a better use of the non-logical mind to support it. "Brains" without "minds" seem a futile unbalance. The inconsistencies of method and purpose and the misunderstandings between large groups which increasing specialization engenders, need the corrective of the feeling mind that senses the end result, the net balance, the interest of the all, and of the spirit that perceiving the concrete parts encompasses also the intangibles of the whole.
>
> Chester I. Barnard
> March 10, 1936

In the 1980's we have brain dominance technology that enables us to bridge the gap between the abstract and the concrete, between the theory and the practice, between the structure and the people. We continue our journey toward discovering and making real the Effective Executive.

APPENDICES

APPENDIX A

INITIAL CONTACT MATERIALS

APPENDIX A:1

LETTER OF INVITATION

Dear <MR.> <TAG>:

In 1983 Case Western University held a symposium on the Executive Mind involving 15 authorities on management and organizations. They sought to better understand the unique mental ingredients that support the executive's ability to manage the dynamics of an organization. Since the early 70s, Edgar Schein of Sloane School of Management--MIT has been studying the career development of senior executives of American organizations in order to identify the key elements that attract persons to their work, called Career Anchors. In 1976 Ned Herrmann, Director of Management Education for General Electric, began developing a brain dominance self-survey instrument which has since been highly validated; 150,000 instruments have been completed to date, building a rich data base of brain dominance patterns as they are related to work.

There has been only limited research done on the brain dominance patterns of top level educational administrators. This professional group of people are going to be key players in leading education through the inevitable organizational and instructional changes which bring us to a new century.

I am a doctoral candidate in the Department of Higher Education Administration at Michigan State University. I have been actively engaged for the past twelve years in the study and dissemination of information about brain research and how it relates to learning and educational settings. For the past two years I have been working with brain dominance as it pertains to management and leadership behaviors in organizations.

Given your key administrative position, I would like to include you in my study of top level public education leaders/administrators in the State of Michigan. Your participation would require only 10-15 minutes to fill out the Herrmann Brain Dominance Instrument and return it to me. In return for your participation, I will score your HBDI and send your consolidated score sheet back within the week, including interpretive materials. If you wish, I will be glad to send a summary of the findings of this study at its completion. After the scoring procedure, your instrument will be entered into a database by number, thereby insuring your anonymity.

If you are willing to participate in this research project, please sign the enclosed stamped consent/response card and return as soon as possible. Please indicate if you would like to receive the summary of findings. I will immediately send the HBDI to you upon receipt of your response.

Thank you for participating in this important study.

Sincerely yours,

APPENDIX A:2

CONSENT CARD

DOCTORAL STUDY RESPONSE FORM

A DESCRIPTIVE STUDY OF THE BRAIN DOMINANCE PATTERNS

OF EDUCATIONAL ADMINISTRATORS

I freely consent to take part in a scientific study being conducted by Mrs. Leslie Wessman under the supervision of Dr. Max R. Raines, Professor--Higher Education Administration and Curriculum at Michigan State University.

The study has been explained to me and I understand the explanation that has been given and what my participation will involve.

I understand that I am free to discontinue my participation in the study at any time without penalty.

I understand that the results of the study will be treated in strict confidence and that I will remain anonymous. Within these restrictions, results of the study will be made available to me at my request.

I understand that, at my request, I can receive additional explanation of the study after my participation is completed.

Signed _____

Date _____

APPENDIX A:3

INTRODUCTION TO THE INSTRUMENT

Please fill in all the blanks on the enclosed survey form, including the # of years of Chief Administrative Exeperience and the # of students your institution serves.

Before beginning the HBDI, please scan the back of the second page to clarify the meaning of terms as they relate to this instrument. Simply answer each question as it relates to your own experience in life--work, home, leisure.

Some further explanations on certain sections are as follows:

Section IV: **Work Elements**

"Do not exceed 4 choices in any one category." This means that you are to rate each work element with a 5, 4, 3, 2, or 1. However, do not use more than 4 5's, 4 3's, etc.

Section VI: **Hobbies**

Interpret "Hobbies" as the types of activity you prefer to do outside of work time.

Section IX: **Adjective Pairs**

Be sure <u>not</u> to leave any of the pairs unmarked.

Thank you for participating in this study. I will score your instrument and send the results to you with interpretive materials within a the week. Please return your HBDI in the enclosed, stamped envelope."

APPENDIX B

FOLLOW-UP LETTER

APPENDIX B

THANK YOU LETTER

Dear <MR.> <TAG>:

Enclosed you will find your Herrmann Brain Dominance Profile with accompanying interpretive materials. This instrument is most typically utilized in awareness and skills development workshops. I have attempted to include information that provides the answers which are typically asked in those workshops.

Please keep in mind as you read over the results of your survey:

** This was **NOT** a psychological or IQ "test". The HBDI is intended to provide an understanding of how mental processing preferences range across the varied dimensions of individual differences based on what is known about the structure and functions of the human brain.

** Your consolidated score sheet provides the specific elements that give your profile its shape and emphasis, based on your own self-perceptions.

** Competencies lie in the areas of brain-dominance. Professional development lies in the areas of use or avoidance.

** A manager who is aware of his or her own mental processes is in a much better position to use all of the quadrants of the brain profile to carry out his or her work. The degree to which the manager can access these different modes and apply them situationally is the degree to which that person can be mentally superior in doing the job.

** The degree to which the manager is aware of and understanding of the unique brains of the other people in the organization is a tremendous advantage in working effectively with them.

The blue sheet will help you understand your own Brain Dominance Profile. The yellow sheet will provide you with some "food-for-thought" about how all of this pertains to administration/management/leadership.

Again, I thank you for your participation in my study. I have received a 64% return from my study group, and I am now in the process of writing the final two chapters of my dissertation. I hope to defend July 28th. If you have requested the findings, you will receive them sometime in August.

Sincerely,

APPENDIX C

RAW DATA FOR THE STUDY

APPENDIX C

RAW DATA FOR THE STUDY

NUMBER	CODE	PROFILE	DLEFT	DRIGHT	DCERB	DLIMB	SSLC	SSLL	SSRL	SSRC	YRSEX	SIZE	TYPE
A-101	1	2111	93	106	103	96	66	74	71	89	3	16000	2
A-103	1	1112	105	84	93	96	83	75	69	57	12	11500	2
A-106	1	2111	96	124	100	120	53	92	89	98	8	120000	1
A-109	1	1112	113	85	81	117	65	105	71	57	7	7200	1
A-111	1	1121	93	92	98	87	72	68	63	75	11	8000	4
A-112	1	1211	83	111	111	83	69	56	69	98	7	13000	1
A-113	1	1122	140	77	95	122	92	119	65	51	13	5300	1
B-101	4	1122	105	80	98	87	81	77	54	66	27	2200	2
B-102	4	2211	70	136	127	79	60	45	74	131	2	3375	4
B-103	4	1221	96	110	125	81	84	60	62	104	3	10500	1
B-106	4	2211	70	128	117	81	53	53	69	123	4	13000	4
B-112	4	2211	74	120	110	84	59	53	74	107	9	6500	1
B-116	4	1221	109	86	118	77	99	65	51	78	7	31388	1
B-117	4	1121	121	83	118	86	102	80	50	75	3	2000	2
B-119	4	1121	91	102	115	78	68	69	48	105	3	1200	4
B-120	4	1122	130	67	90	107	81	114	47	54	3	5000	1
B-123	4	2211	76	138	117	97	53	62	84	123	18	27000	3
B-124	4	1121	120	79	109	90	96	84	51	68	17	4800	3
B-128	4	1121	126	75	114	87	99	90	41	72	2	12000	1
C-301	7	1221	82	103	126	59	83	41	48	107	20	5600	2
C-303	7	2221	74	112	129	57	66	45	41	128	3	14000	1
C-307	7	1221	81	117	121	77	71	51	65	111	12	7600	3
C-308	7	2111	54	71	77	111	54	71	77	111	12	6100	3
C-309	7	1112	114	86	91	109	78	93	71	59	10	5300	2
C-310	7	1122	133	67	102	98	93	107	41	60	11	6000	2
C-311	7	1112	101	97	93	105	77	75	83	63	4	12500	1
C-313	7	2321	55	138	128	65	51	32	66	141	2	11700	1
C-315	7	2221	83	104	118	69	62	63	41	116	12	5400	3
C-316	7	1122	123	74	97	100	92	93	57	54	3	5200	3
C-317	7	2121	87	114	105	96	51	80	65	107	4	6000	3
C-318	7	1122	131	60	88	103	80	117	38	53	16	5600	3
C-319	7	2111	91	109	96	104	51	86	71	93	32	5400	2
C-320	7	1111	96	114	110	100	77	68	83	89	8	31600	1
C-321	7	1221	80	111	130	61	68	53	39	128	8	5000	3
C-322	7	1123	148	44	107	85	132	90	38	29	3	5900	3
C-323	7	2111	89	105	102	92	65	69	69	89	15	7400	3
C-325	7	1211	82	112	109	85	71	53	75	93	11	5500	2
C-326	7	1131	124	68	104	88	81	105	27	75	15	8000	1
C-334	7	3111	68	151	87	132	32	71	128	99	10	9000	3
C-335	7	2121	104	90	87	107	59	98	63	72	8	8500	3
C-337	7	1121	122	86	121	87	104	80	51	78	16	16000	1
C-339	7	1122	123	76	104	95	90	95	48	66	5	7800	3
C-341	7	1122	124	79	89	114	75	111	60	59	3	10500	1
C-343	7	1112	117	81	77	121	75	101	81	41	23	7400	3
C-344	7	2111	91	111	106	96	63	74	71	96	5	8100	1
C-345	7	1231	95	92	128	59	83	60	29	110	9	17000	1

NUMBER	CODE	PROFILE	DLEFT	DRIGHT	DCERB	DLIMB	SSLC	SSLL	SSRL	SSRC	YRSEX	SIZE	TYPE
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C-353	7	1112	129	89	91	127	77	117	74	60	19	18300	1
C-356	7	1121	121	79	112	88	101	81	51	68	9	7500	1
C-357	7	1122	129	76	96	109	86	108	56	59	15	8900	3
D-101	10	2121	113	95	102	106	59	111	48	95	8	15000	4
D-103	10	2121	98	114	111	101	60	87	65	107	18	5500	4
D-105	10	1121	119	83	96	106	69	110	50	75	8	30500	4
D-106	10	2131	98	81	105	74	66	81	30	92	26	7500	4
D-107	10	1132	150	58	116	92	120	105	33	54	34	30700	2
D-108	10	1121	104	98	113	89	80	77	57	90	21	7600	4
D-109	10	1222	113	74	115	72	107	63	45	66	15	9500	4
D-110	10	1122	135	53	85	103	89	114	41	39	19	11300	4
D-113	10	1122	106	71	80	97	71	89	57	50	12	10300	4
D-114	10	1122	130	57	107	80	111	84	36	50	11	9500	4
D-115	10	1121	110	89	106	93	86	80	60	74	6	7800	4
D-116	10	1121	100	106	130	76	80	71	44	116	21	14500	4
D-119	10	1221	91	94	101	84	74	63	63	78	22	20100	2
D-121	10	1122	137	59	86	110	83	123	42	47	19	8000	4
D-122	10	2111	99	109	89	119	56	93	86	78	19	7600	4
D-123	10	1131	118	72	122	68	108	69	33	75	14	6500	4
D-127	10	2121	84	115	109	90	53	74	62	111	15	28900	1
D-129	10	1122	127	68	94	101	87	104	48	54	3	100000	1
D-130	10	1122	102	84	95	91	77	77	60	66	7	15000	3
D-132	10	1132	131	62	116	77	113	84	32	62	17	20000	2
D-134	10	1122	145	58	98	105	111	107	51	36	27	3500	4
D-137	10	2121	113	83	89	107	62	108	53	72	11	10000	4
D-138	10	1122	135	50	92	93	98	105	35	41	1	5000	4
D-139	10	1132	149	42	104	87	120	104	27	36	21	135000	1
D-140	10	1122	118	74	96	96	95	83	62	50	17	25000	1
D-142	10	2111	87	112	88	111	54	77	90	78	22	35500	1
D-143	10	2121	115	94	92	117	62	111	65	77	27	8100	4
D-144	10	1112	108	98	95	111	78	84	83	65	16	200000	3
D-145	10	1211	98	101	104	95	81	66	77	75	17	4800	4
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D-147	10	1122	132	66	94	104	89	110	47	53	8	10000	4
D-148	10	1122	121	75	100	96	96	86	59	54	15	42000	1
D-149	10	2111	100	105	93	112	60	90	78	80	28	27000	3
D-151	10	1121	100	91	114	77	78	72	44	93	12	8500	4
D-152	10	1121	103	95	118	80	78	77	44	99	14	16400	4
D-153	10	1221	113	79	117	75	107	63	50	69	31	15000	2
D-154	10	2121	91	113	104	100	45	92	59	111	10	16000	2
D-155	10	1112	109	91	77	123	69	95	90	47	17	40000	1
D-157	10	1122	127	60	88	99	86	105	44	47	9	9900	4
E-101	10	2211	82	133	124	91	60	63	74	126	23		5

NUMBER	CODE	PROFILE	DLEFT	DRIGHT	DCERB	DLIMB	SSLC	SSLL	SSRL	SSRC	YRSEX	SIZE	TYPE
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F-104	11	1123	154	45	83	116	95	137	38	30	12	1190	4
F-105	11	1221	83	107	130	60	86	39	51	110	3	300	4
F-106	11	2111	107	103	88	122	57	104	80	75	6	800	4
F-107	11	1111	91	103	101	93	69	68	72	83	12	434	4
F-108	11	1123	134	55	78	111	87	114	53	30	9	1400	4
F-109	11	1113	128	71	81	118	89	104	74	33	5	2000	4
F-110	11	1221	100	94	128	66	105	45	54	87	25	1300	2
F-112	11	1122	130	59	96	93	102	93	47	42	10	2500	3
F-114	11	1121	97	97	109	85	68	78	50	96	5	1805	4
F-115	11	1122	115	84	91	108	74	99	63	63	12	4300	2
F-116	11	2111	109	105	79	135	51	113	90	68	6	2300	3
F-117	11	1221	96	99	128	67	78	66	35	114	15	4300	3
F-118	11	1122	116	78	100	94	84	90	51	66	18	1400	4
F-119	11	3211	55	146	110	91	32	51	86	134	7	1900	3
F-120	11	1123	136	59	77	118	84	120	57	32	20	400	4
F-121	11	1121	106	86	111	81	81	78	44	86	4	3000	3
F-123	11	1122	127	77	101	103	93	98	57	59	16	2800	4
F-124	11	1111	109	100	107	102	84	80	74	77	7	2000	3
F-126	11	1122	116	69	98	87	92	83	48	56	18	900	4
F-127	11	1122	149	62	102	109	114	110	54	39	2	4700	1
F-133	11	2121	112	99	89	122	47	122	62	87	4	1300	4
F-134	11	1122	133	65	102	96	105	95	50	48	4	2100	4
F-136	11	1221	94	108	124	78	81	60	57	105	12	3900	3
F-138	11	2111	93	116	103	106	62	78	81	93	7	300	4
F-139	11	1111	111	98	114	95	99	68	75	72	1	2000	4
F-140	11	2211	62	141	104	99	41	53	96	116	16	5000	1
F-141	11	1111	99	95	101	93	77	72	68	75	5	3300	2
F-142	11	1121	109	86	92	103	69	95	60	69	9	700	2
F-143	11	1122	116	74	105	85	93	81	47	65	20	200	4
F-144	11	1121	120	83	108	95	93	87	56	69	16	3500	3
F-145	11	2121	106	92	96	102	66	93	60	78	6	3400	3
F-146	11	1221	83	109	126	66	68	57	42	122	8	400	4
F-147	11	1121	99	94	114	79	78	71	48	93	10	2200	4
F-153	11	1221	101	91	106	86	87	65	65	72	3	2100	3
F-155	11	1121	115	83	108	90	89	84	51	74	15	2500	2
F-156	11	1121	105	91	98	98	72	86	62	75	4	1600	4
F-157	11	1122	126	83	95	114	78	111	60	65	19	3200	4
F-159	11	1121	103	88	101	90	81	74	62	71	28	1000	4
F-160	11	2112	99	89	70	118	44	105	72	62	9	3300	3
F-162	11	2111	87	118	102	103	48	83	72	105	9	4500	3
F-165	11	1121	92	106	110	88	68	71	62	98	8	2600	4
F-168	11	2112	91	108	83	116	59	78	96	66	8	2000	3
F-171	11	1121	112	93	104	101	83	86	66	74	20	3550	2
F-174	11	1122	120	65	94	91	89	92	45	53	12	2800	2

NUMBER	CODE	PROFILE	DLEFT	DRIGHT	DCERB	DLIMB	SSLC	SSLL	SSRL	SSRC	YRSEX	SIZE	TYPE
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AA-103	2	1112	115	77	80	112	77	96	72	44			
AA-107	2	1121	111	85	118	78	86	81	36	92			
AA-109	2	2111	81	129	83	127	44	78	113	81			
AA-111	2	2112	81	120	72	129	42	80	114	66			
AA-113	2	1112	119	86	92	113	83	96	74	56			
AB-101	3	1121	106	84	108	82	81	78	45	81			
AB-102	3	1131	112	76	125	63	95	74	21	93			
AB-104	3	1122	126	62	98	90	99	90	45	48			
AB-109	3	1121	111	81	113	79	89	78	41	81			
AB-111	3	1122	131	69	117	83	116	81	44	60			
AB-114	3	1231	118	81	141	58	123	54	33	89			
AB-115	3	1112	118	87	99	106	86	92	68	63			
BA-103	5	1122	127	59	106	80	108	83	38	51			
BA-111	5	2211	77	122	109	90	59	57	78	105			
BA-113	5	1212	104	98	108	94	96	60	81	66			
BA-118	5	1221	92	98	118	72	83	56	53	95			
BA-119	5	1111	103	99	103	99	78	77	72	77			
BA-120	5	1122	131	61	98	94	102	95	47	45			
BA-122	5	1122	121	78	101	98	86	96	51	66			
BA-123	5	2111	84	135	105	114	48	78	93	110			
BA-125	5	2221	79	125	135	69	62	57	47	141			
BA-126	5	1121	116	84	97	103	77	98	57	69			
BA-129	5	1211	84	118	110	92	68	59	80	98			
BB-104	6	1121	123	83	123	83	110	75	50	75			
BB-106	6	1132	141	50	110	81	117	95	27	48			
BB-107	6	1122	118	73	85	106	81	96	63	47			
BB-110	6	1122	131	67	111	87	104	93	38	63			
BB-111	6	2112	116	78	65	129	62	113	81	36			
BB-112	6	1133	154	36	107	83	132	99	26	29			
BB-118	6	1123	139	51	75	115	83	126	47	30			
BB-119	6	1122	112	79	94	97	83	86	60	59			
BB-120	6	1221	113	82	136	59	117	53	36	87			
BB-123	6	1122	126	77	92	111	81	108	59	57			
BB-124	6	1122	130	66	96	100	102	93	57	42			
BB-128	6	1132	123	61	117	67	113	72	29	63			
BB-129	6	1122	133	65	96	102	92	108	45	53			
CA-302	8	1121	123	77	96	104	74	111	45	71			
CA-303	8	1122	126	69	100	95	89	101	42	62			
CA-304	8	2112	123	84	71	136	59	126	78	48			
CA-305	8	1121	105	86	101	90	71	87	48	81			
CA-307	8	1131	106	82	117	71	86	74	33	90			
CA-308	8	2211	60	144	93	111	36	54	113	104			
CA-310	8	3111	73	125	83	115	33	77	96	92			
CA-311	8	2121	92	97	108	81	60	78	44	102			
CA-313	8	1121	114	84	104	94	68	104	38	89			

NUMBER	CODE	PROFILE	DLEFT	DRIGHT	DCERB	DLIMB	SSLC	SSLL	SSRL	SSRC	YRSEX	SIZE	TYPE
CA-314	8	2211	83	122	96	109	62	63	101	83			
CA-316	8	3111	61	146	96	111	23	69	98	122			
CA-317	8	3211	59	159	103	115	23	66	107	132			
CA-318	8	2112	92	110	81	121	59	80	102	63			
CA-319	8	1121	97	86	108	75	72	74	39	90			
CA-320	8	2111	78	126	90	114	41	77	95	95			
CA-322	8	2121	98	82	93	87	60	87	44	80			
CA-328	8	1123	147	49	88	108	99	122	41	33			
CA-329	8	1122	124	73	74	123	68	119	66	44			
CA-333	8	1211	93	108	111	90	75	65	71	92			
CA-336	8	2112	104	103	78	129	66	90	104	51			
CA-338	8	1121	117	80	125	72	105	71	38	83			
CA-341	8	2211	68	138	87	119	38	65	114	93			
CA-344	8	2211	66	125	84	107	38	62	99	89			
CA-349	8	3211	63	140	94	109	29	66	98	113			
CA-358	8	1132	128	58	118	68	117	75	27	60			
CB-302	9	2121	92	102	107	87	60	78	53	101			
CB-304	9	1122	121	64	97	88	86	96	36	60			
CB-305	9	1122	129	63	87	105	84	110	48	47			
CB-307	9	1132	139	43	104	78	113	96	21	44			
CB-311	9	2111	95	110	96	109	50	93	71	95			
CB-313	9	2211	81	136	100	117	56	66	110	95			
CB-316	9	1122	141	56	104	93	111	101	39	45			
CB-317	9	1122	134	67	108	93	114	87	53	48			
CB-318	9	1131	120	67	110	77	95	86	30	71			
CB-319	9	1123	145	50	86	109	102	116	48	27			
CB-321	9	1121	113	95	107	101	83	87	65	78			
CB-323	9	1222	111	70	96	85	102	65	63	42			
CB-324	9	1132	143	38	112	69	125	90	14	44			
CB-325	9	1221	89	112	128	73	75	59	51	117			
CB-327	9	1131	125	65	124	66	114	74	26	72			
CB-329	9	1133	152	35	105	82	125	104	20	33			
CB-333	9	1122	131	73	101	103	89	108	47	63			
CB-341	9	1131	112	73	117	68	87	81	21	89			
CB-344	9	1112	117	90	90	117	71	105	71	65			
CB-347	9	1121	113	82	102	93	86	84	56	68			
CB-349	9	1122	119	73	99	93	90	89	51	59			
CB-350	9	2111	76	120	97	99	36	78	71	110			
CB-352	9	1112	120	86	96	110	87	93	72	57			
CB-356	9	1121	112	81	110	83	90	78	47	75			
CB-357	9	1221	91	91	103	79	71	66	53	84			
G-101	12	1122	132	65	103	94	95	104	38	60	1	7000	4
G-103	12	3121	78	116	94	100	26	92	59	116	8	2600	3
G-104	12	2111	104	108	74	138	41	116	92	71	3	180	4
G-105	12	2111	84	112	93	103	48	78	77	92	2	3400	3
G-106	12	2112	97	91	82	106	57	89	71	66	6	2100	4

NUMBER	CODE	PROFILE	DLEFT	DRIGHT	DCERB	DLIMB	SSLC	SSLL	SSRL	SSRC	YRSEX	SIZE	TYPE
G-107	12	3111	77	129	80	126	29	87	102	92	3	1100	4
G-108	12	2211	70	118	108	80	54	48	72	105	3	1700	4

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