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UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

MILITARY LEADERSHIP EFFICIENCY: MEASURING PERCEPTIONS OF LEADERSHIP EFFICIENCY IN THE RANKS

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

Doctor of Philosophy

By

Eric M. Morrison
Norman, Oklahoma
2002

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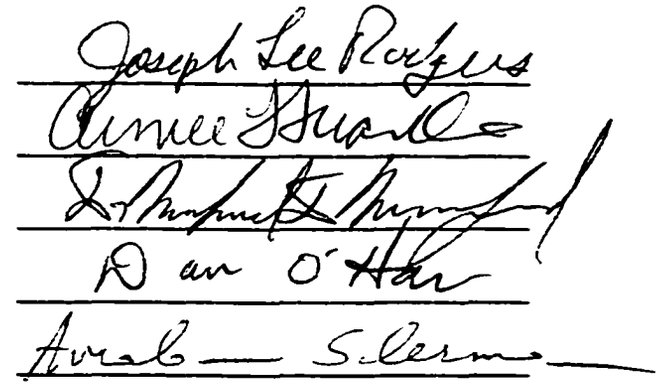
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A Dissertation APPROVED FOR THE
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Acknowledgements

There are many life choices that we face. Without the love and support of my family, my life would not have amounted to much. A life choice directs us, guides us, and leads on paths we might never have thought of. I thank God for the path He made for me. I dedicate this to my wife Sompong, and kids Rose, Alex, Victoria, Denise, and William. For my father, Mike Morrison, who gave me the drive, desire, and the passion to always strive for answers. I would like to acknowledge my entire family and friends for their enthusiastic support and motivation.

I want to thank Dr. Joe Rodgers for the immeasurable mentorship, patience, motivation, and leadership he gave me on this journey. I want to thank Dr. H. Dan O'Hair, Dr. Abraham Scherman, Dr. Mike Mumford, and Dr. Aimee Franklin for their tireless support in my pursuit of an idea. Lastly, I want to thank the United States Army, where I am proud of the life choice I made for my career, and the support of all soldiers, noncommissioned officers, and officers who unselfishly give their lives for their country everyday.

Table of Contents

Page

Copyright Page iii

Acknowledgements iv

List of Tables viii

List of Illustrations x

Terminology xii

Abstract xvii

Chapter 1: Purpose and Introduction 1

Chapter 2: Review of the Literature, Rational, and Hypotheses 7
- Military Leadership 7
  - Leadership Functions 11
  - Situational Awareness Function 11
  - Knowledge Function 12
  - Decision-Making Function 12
  - Interpersonal Interaction Function 13
  - Character Function 13
  - Organization Over Person Function 15
  - Policy and Records Function 15
- Feedback Mechanism 16
- Research Implications 18
- Unit of Analysis and Conceptual Framework 19
- Conceptual Review 19
- Rationale and Hypotheses 23

Chapter 3: Methodology 28
- Overview 28
- Leadership Training Background 29
- Setting 30
- Participants Pilot Survey 31
- Pilot Survey Results 31
- Design and Variables 34
- Dependent Variables 35
- Independent Variables 36
- Survey Design and Questions 41
- Data Analysis 42

Page

Chapter 4: Results 51
Descriptive Statistics 51
Hypothesis 1 57
Reliablity 57
Factor Analysis 58
Hypothesis Testing 60
Hypothesis 2 76
Reliablity 76
Factor Analysis 77
Hypothesis Testing 78
Hypothesis 3 82
Hypothesis Testing 82

Chapter 5: Discussion 87
Overview 87
Summary 87
Interpretation 88
Hypothesis 1 88
Hypothesis 2 90
Hypothesis 3 91
Context 92
Implications 93
Research Issues 93
Limitations 94
Threats to Internal Validity 95
Population Validity 98
Ecological Validity 98
Future Directions 101

References 104

Appendix A. SAS Results Hypothesis One 110
Factor Analysis for Prior Abilities 110
Kaiser's Measure of Sampling Adequacy 110
Scree Plot 110
Factor Analysis Varimax Rotation 111
Cronbach Coefficient Alpha on Original Leadership Scale 111
Cronbach Coefficient Alpha on Rescaled Leadership Scale 111
Hypothesis Testing for Prior Abilities 112
Original Leadership Scale Testing 112
Rescaled Leadership Scale Testing 114
Factor Analysis for During Abilities 117
Kaiser's Measure of Sampling Adequacy 117
Scree Plot 117

Page

Factor Analysis Varimax Rotation 118
Cronbach Coefficient Alpha on Original Leadership Scale 118
Cronbach Coefficient Alpha on Rescaled Leadership Scale 118
Hypothesis Testing for During Abilities 119
Original Leadership Scale Testing 119
Rescaled Leadership Scale Testing 121
Factor Analysis for Leadership Applications 124
Kaiser's Measure of Sampling Adequacy 124
Scree Plot 124
Factor Analysis Varimax Rotation 125
Cronbach Coefficient Alpha on Original Leadership Scale 125
Cronbach Coefficient Alpha on Rescaled Leadership Scale 125
Hypothesis Testing for Leadership Applications 126
Original Leadership Scale Testing for Overall Leadership Application . 126
Rescaled Leadership Scale Testing for Overall Leadership Application 126

Appendix B. SAS Results Hypothesis Two 127
Factor Analysis for Satisfaction Measures 127
Kaiser's Measure of Sampling Adequacy 127
Scree Plot 127
Factor Analysis Varimax Rotation 128
Cronbach Coefficient Alpha on Original Leadership Scale 128
Cronbach Coefficient Alpha on Rescaled Leadership Scale 128
Hypothesis Testing for Satisfaction Measures 129
Original Leadership Scale Testing 129
Rescaled Leadership Scale Testing 130

Appendix C. SAS Results Hypothesis Three 132
Hypothesis Testing for Unit by Rank 132
Original Leadership Scale Testing 132
Rescaled Leadership Scale Testing 132

Appendix D. Pilot Survey 133

Appendix E. Leadership Survey 138

List of Tables

Number *Page*

Table 1. Combat Arms Unit Distribution 31

Table 2. Factor Analysis Factor Pattern Coefficients of Pilot Survey Participants 33

Table 3. Combat Arms/ Combat Support/ Combat Service Support Unit Distribution 51

Table 4. Unit Data Collection Dates 52

Table 5. Pearson's Correlation Coefficients for Prior, During, and Applied Functions: Validity Coefficients 54

Table 6. Pearson's Correlation Coefficients for Overall and Composite Prior, During, and Applied Functions: Validity Coefficients 55

Table 7. Simple Statistics for Prior Leadership Abilities 61

Table 8. Simple Statistics for During Leadership Abilities 61

Table 9. The Best Fitting Model Statements for each Prior Predictor Combined with Unit 64

Table 10. The Best Fitting Model Statements for each During Predictor Combined with Unit 65

Table 11. Analysis of Variance for Dependent Variable of Leadership Efficiency by Unit & Prior Abilities (Between Subjects) 66

Table 12. Analysis of Variance for Dependent Variable of Leadership Efficiency by Unit & During Abilities (Between Subjects) 67

Table 13. Simple Statistics for Leadership Efficiency Application 69

Table 14. Simple Statistics for Leadership Validity Items and Scaled Measures 70

Table 15. Simple Statistics for Leadership Efficiency Application Rescaled Measures 71

Table 16. Simple Statistics for Leadership Validity Items and Rescaled Measures 72

Table 17. The Best Fitting Model Statements for each Predictor Combined with Unit. 72

Table 18. Analysis of Variance for Leadership Efficiency by Unit & Overall Efficiency (Between Subjects). 74

List of Tables

Number *Page*

Table 19. Simple Statistics for Satisfaction Measures. 78

Table 20. The Best Fitting Model Statements for each Satisfaction Predictor Combined with Unit. 79

Table 21. Analysis of Variance for Leadership Efficiency by Unit and Satisfaction (Between Subjects). 80

Table 22. The Best Fitting Model Statements for each Rank Predictor Combined with Unit. 83

Table 23. Analysis of Variance for Leadership Efficiency by Unit and Rank (Between Subjects) 84

List of Figures

Number *Page*

Figure 1. Continuum of Leader and Worker Efforts....21

Figure 2. Composite Mean of each Leadership Function from the Optimal Mean....21

Figure 3. Potential Stochastic Plot: Productivity versus Efficient Leadership State....22

Figure 4. Military Leadership Model Effectiveness versus Efficiency....23

Figure 5. Factor Analyses of the Following Groups of Independent and Dependent Variables....43

Figure 6. Research Design Concept Hypothesis One....44

Figure 7. Leadership Research Design Hypothesis One....45

Figure 8. Leadership Research Design Hypothesis One....46

Figure 9. Research Design Concept Hypothesis Two....47

Figure 10. Leadership Research Design Hypothesis Two....48

Figure 11. Research Design Concept Hypothesis Three....49

Figure 12. Leadership Research Design Hypothesis Three....50

Figure 13. Leadership Ability Composite Scores by Leadership Abilities....62

Figure 14. Prior Ability Composite Scores by Unit....62

Figure 15. During Ability Composite Scores by Unit....63

Figure 16. Leadership Efficiency Application Composite Scores by Unit....70

Figure 17. Overall Composite Ability Scores by Unit....71

Figure 18. Rescaled Leadership Efficiency Composite Scores by Unit....73

Figure 19. Leadership Efficiency Measures by Unit....73

Figure 20. Leadership efficiency application Composite Scores by Percentage of Sample....75

List of Figures

Number *Page*

Figure 21. Rescaled Leadership efficiency application Composite Scores by Percentage of Sample 76

Figure 22. Composite Satisfaction Scores by Unit 79

Figure 23. Leadership Efficiency Composite Application Scores by Unit 85

Figure 24. Rescaled Leadership Efficiency Application Composite Scores by Rank 86

Figure 25. Rescaled Leadership Efficiency Application Composite Scores by Rank 86

Figure 26. Rescaled Leadership Application Score by Rank representing Leadership Bands of Efficiency 101

Terminology

Administrative Policy: Army leaders must bring together leadership, personnel management, and training management to ensure their organizations are assigned people with the right specialties and that the entire organization is trained and ready. See FM 22-100 (Department of the Army, 1999)

After Action Review (AAR): A method of providing feedback to units by involving participants in the training diagnostic process in order to increase and reinforce learning. The AAR leader guides participants in identifying deficiencies and seeking solutions. The after-action review is the official primary feedback mechanism for leaders and followers in the military. See FM 25-101 (Department of the Army, 1990)

Army Regulation: Army publications that establish policies and responsibilities and prescribe the administrative procedures necessary to implement policies. They do not contain historical information; they are permanent publications and remain in effect until changed, replaced, or rescinded. See FM 25-101 (Department of the Army, 1990)

Assessing: Involves evaluating the **efficiency** and **effectiveness** of any system or plan in terms of its purpose and mission. See FM 22-100 (Department of the Army, 1999)

Battle Command (BC) (Army): The art of battle decision making and leading. It includes controlling operations and motivating soldiers and their organizations into action to accomplish missions. Battle command includes visualizing the current state and a future state, then formulating concepts of operations to get from one to the other at least cost. It also includes assigning missions, prioritizing and allocating resources, selecting the critical time and place to act, and knowing how and when to make adjustments during the fight. See FM 100-5. See FM 101-5-1 (Department of the Army, 1997)

Character: Character is made up of two interacting parts: values and attributes, in which the leader transmits this through his/her personality. The Army is led by leaders of character who are good role models, consistently set the example, and accomplish the mission while improving their units. The personality is the complex set of characteristics that distinguishes an individual or a nation or group; especially: the totality of an individual's behavioral and emotional characteristics (WWWebster, 2002). See FM 22-100 (Department of the Army, 1999)

Combat Arms: Units and soldiers who close with and destroy enemy forces or provide firepower and destructive capabilities on the battlefield. The included branches and functions are: Air Defense Artillery, Armor/Cavalry, Aviation, Field Artillery, Infantry, Special Forces, and the Corps of Engineers. See FM 101-5-1 (Department of the Army, 1997)

Combat Service Support (CSS): The essential capabilities, functions, activities, and tasks necessary to sustain all elements of operating forces in theater at all levels of war. Within the national and theater logistic systems, it includes but is not limited to that support rendered by service forces in ensuring the aspects of supply, maintenance, transportation, health services, and other services required by aviation and ground combat troops to permit those units to accomplish their missions in combat. Combat service support encompasses those activities at all levels of war that produce sustainment to all operating forces on the battlefield. (Army) — CSS also include those activities in stability and support operations that sustain all operating forces. The included branches and functions are: Adjutant General Corps, Acquisition Corps, Chaplain Corps, Finance Corps, Judge Advocate General Corps, Medical Corps, Ordnance Corps, Transportation Corps, and the Quartermaster Corps. See FMs 8-10, 10-1, 100-5, and 100-10. See FM 101-5-1 (Department of the Army, 1997)

Combat Support (CS): Units and soldiers that provide critical combat functions in conjunction with combat arms units and soldiers to secure victory. The included branches and functions are: Chemical Corps, civil affairs, psychological operations, Military Intelligence, Military Police Corps, and the Signal Corps. See FM 101-5-1 (Department of the Army, 1997)

Command: The authority that a commander in the Military Service lawfully exercises over subordinates by virtue of rank or assignment. Command includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions. It also includes responsibility for health, welfare, morale, and discipline of assigned personnel. 2. An order given by a commander; that is, the will of the commander expressed for the purpose of bringing about a particular action. 3. A unit or units, an organization, or an area under the command of one individual. 4. To dominate by a field of weapon fire or by observation from a superior position. (See also battle command and commander.) See FMs 22-100, 22-103, 100-5, and 101-5. See FM 101-5-1 (Department of the Army, 1997)

Commander: One who is in command because of rank, position, or other circumstances. (See also battle command and command. See FM 101-5-1 (Department of the Army, 1997)

Commanding Officer: An officer in command; especially: an officer in the armed forces in command of an organization or installation. (WWWebster, 2002)

Commissioned Officer: An officer of the armed forces holding by a commission a rank of second lieutenant or ensign or above. (WWWebster, 2002)

Decision-making: Is the process that begins to change that situation. Thus, decision-making is knowing whether to decide, then when and what to decide. It includes understanding the consequences of your decisions, your end state, how you want things to look when the mission is complete. These established and proven methodologies combine elements of the planning operating action to save time and achieve parallel decision making and planning. 5-22. Make and execute your decision. Prepare a leader's plan of action, if necessary, and put it in motion to execute their assigned responsibilities and missions. They stay mentally and emotionally detached from their immediate surroundings so they can visualize the larger impact on the organization and mission. Soldiers and subordinate leaders look to their organizational leaders enable and focus execution. The training management and military decision-making processes provide a ready-made, systemic approach to planning, preparing, executing, and assessing. See FM 22-100 (Department of the Army, 1999)

Doctrine: Fundamental principles by which military forces guide their actions in support of objectives. It is authoritative, but requires judgment in application. See FM 25-101 (Department of the Army, 1990)

Effective: Producing a decided, decisive, or desired effect. (WWWebster, 2002)

Efficiency: Efficiency as defined, is directly producing an effect or result, product causative, with minimum effort, expense, or waste; or the ratio of the useful energy delivered by a dynamic system to the energy supplied to it. See (WWWebster, 2002)

Enlisted: A man or woman in the armed forces ranking below a commissioned or warrant officer; specifically: one ranking below a noncommissioned officer or petty officer. (WWWebster, 2002)

Executing: Involves meeting mission standards, taking care of people, and efficiently managing resources. The act or mode or result in performance (WWWebster, 2002). See FM 22-100 (Department of the Army, 1999)

Feedback: Is the transmission of evaluative or corrective information to the original or controlling source about an action, event, or process (WWWebster, 1999).

Influence: The act or power of producing an effect without apparent exertion of force or direct exercise of command, the power or capacity of causing an effect in indirect or intangible ways. Such as the organization's or higher-headquarters' influence on a unit. (WWWebster, 2002)

Knowledge: A leader must have a certain level of knowledge to be competent. Good leaders add to their knowledge and skills every day. True leaders seek out opportunities; they're always looking for ways to increase their professional knowledge and skills. It's a key attribute of the art of command and the transformation of knowledge into understanding. See FM 22-100 (Department of the Army, 1999)

Leadership: The Army formally defines leadership in Field Manual 22-100, page 1-4, Leadership is influencing people—by providing purpose, direction, and motivation—while operating to accomplish the mission and improving the organization. See FM 22-100 (Department of the Army, 1999)

Leadership efficiency: Can then be defined as the measurement of an influence process to determine minimum effort, expense, or waste that occurs naturally within a social system and is perceptually shared among its members (Yukl, 1998; WWWebster, 1999).

Macro: Involving, or intended for use with relatively large quantities or on a large-scale activity. (WWWebster, 2002)

Management: The act of supervising of something, such as a task or activity, as the means to accomplish an end in the direction of enterprise. (WWWebster, 2002)

Micro: Involving minute quantities or variations, a part of a larger activity. (WWWebster, 2002)

Military: Relating to the Army. (WWWebster, 2002)

Mission: The primary task assigned to an individual, unit, or force. It usually contains the elements of who, what, when, where, and the reasons therefore, but seldom specifies how. See FM 25-101 (Department of the Army, 1990)

Noncommissioned Officer: A subordinate officer (as a sergeant) in the army, air force, or marine corps appointed from among enlisted personnel. (WWWebster, 2002)

Operation: A military action or the carrying out of a strategic, tactical, service, training, or administrative military mission; the process of carrying on combat, including movement, supply, attack, defense, and maneuvers needed to gain the objectives of any battle or campaign. See FMs 1-111, 6-20, 7-20, 7-30, 17-95, 71-100, 71-123, 100-5, 100-15, and 101-5. See FM 101-5-1 (Department of the Army, 1997)

Organization: A functional structure, such as higher-headquarters of a military unit that supervises and directs the operations of a unit. (WWWebster, 2002)

Perception: The respondent's awareness of the elements of leader's within a unit. A quick, acute, and intuitive cognition revealed through assessment. (WWWebster, 2002)

Planning: Involve developing detailed, executable plans that are feasible, acceptable, and suitable; arranging unit support for the exercise or operation; and conducting rehearsals. During tactical operations, decision making and planning are enhanced by two methodologies: the military decision making process (MDMP) and the troop leading procedures (TLP). Company and lower echelons follow the TLP. (FM 101-5 discusses the MDMP.) See FM 22-100 (Department of the Army, 1999)

Policy: The Army devises a definite course or method of action selected from among alternatives and in light of given conditions to guide and determine present and future decisions. This is a high-level overall plan embracing the general goals and acceptable procedures especially of a governmental body. (WWWebster, 2002)

Record: The Army maintains an authentic official copy of a policy in the form of memorandums for future reference. (WWWebster, 2002)

Situation(al) Awareness: The Army formally defines SA in TRADOC Pam 525-5, Force XXI Operations, as the ability to have accurate real-time information of friendly, enemy, neutral, and non-combatant locations; a common, relevant picture of the battlefield scaled to specific levels of interest and special needs. Leaders having or showing realization, perception, or knowledge of changes of a relative position or combination of circumstances at a certain moment. (WWWebster, 2002)

Soldier: One engaged in military service and especially in the army, an enlisted man or woman who is a skilled warrior. (WWWebster, 2002)

Task: A clearly defined and measurable activity accomplished by soldiers and units. Tasks are specific activities, which contribute to the accomplishment of encompassing missions or other requirements. See FM 25-101 (Department of the Army, 1990)

Tempo: The rate of military action; controlling or altering that rate is a necessary means to initiative. All military operations alternate between action and pauses as opposing forces battle one another and fight friction to mount and execute operations at the time and place of their choosing. See FM 100-5. See FM 101-5-1 (Department of the Army, 1997)

Training: The instruction of personnel to individually and collectively increase their capacity to perform specific military functions and tasks. See FM 25-101 (Department of the Army, 1990)

Training Management: The process used by Army leaders to identify training requirements and subsequently plan, resource, execute, and evaluate training. See FM 25-101 (Department of the Army, 1990)

Abstract

The purpose of this study was to examine leadership efficiency in the context of the United States Army. Soldiers, Noncommissioned Officers, and Officers were the focus of the study. The study sought to develop a quantifiable measure of leadership efficiency based on the perceptions of soldiers and their leaders in company-sized units. Secondly, the study was interested in the level of leadership efficiency as represented in leadership functions among military leaders from the perspectives of soldiers among the ranks for a given training situation.

The study's intentions were: first to assess perceptions that were situationally appropriate, second to introduce an instrument that supports anonymous feedback, third to use that instrument to coherently measure leadership application, fourth to focus on members in company-sized units after a training event, and fifth to develop models of the factors influencing efficient leadership. Leadership functions were measured in several categories, including knowledge, decision-making, interpersonal interaction, character, organization-over-person, situational awareness, and policies and records. These categories were viewed prospectively in the context of the production function, in this case through a standardized military training event, which provided a macro-viewpoint of military leadership efficiency.

CHAPTER 1

Purpose and Introduction

Purpose

Military leadership efficiency among the ranks provides leaders a potentially quantifiable measure of their leadership in relation to productive outputs in time. The military consistently measures the leader's effectiveness in the field. To improve the leader's ability, the United States Army has psychometric inventories to measure leader effectiveness from the soldier and leader's perspectives (Department of the Army, 1986, 1994). Leadership efficiency though categorized has not been previously studied in relation to military leadership (Hershey, Blanchard & Johnson, 1996). This analysis is focused to take a holistic approach at measuring the leadership climate of a company-sized unit from the perspectives of soldiers, as functional input to production output, within a military leadership system.

The study aims at the Army company, as the core unit in the execution of Army missions perspectives (Department of the Army, 1988, 1990). The focus of the study is to capture a leadership efficiency measure between three groupings of units, combat arms, combat support, and combat service support. The study intends to obtain individual soldier perceptions of the leadership function inputs and measure it against unit leadership output after a scheduled training event, thus calculating efficiency. The leader, the led, communication, situations, and time are crucial factors in determining the efficient leadership outcomes in a military training event and are a part of the Army leadership doctrine (Department of Army, 1999). Determining military leadership

efficiency from the leader and soldier perspective depends on the functions of leadership and the characteristics within each function.

The study is not intended to evaluate individual leadership within any unit on the micro level. The study attempts to capture a macro measure of leadership perceptions that impact training performance of each unit within a group/team paradigm. The material presented in this study represents the opinions of the author and does not necessarily represent the views of the United States Army or the Department of Defense.

Introduction

The military has traditionally been aware of the need for sound leadership. The Army has created separate manuals for its leaders, to guide and instruct the proper behaviors of its leaders in the context of the military organization. Contextualism, "a sensitivity to the interdependency between how things appear and the environment which causes them to appear" (Wheatley, 1992,p. 63), is where the military has described integrated behavioral patterns within a military ecosystem to improve performance. In a military ecosystem, the effects of change impact military leader actions by the multitude of variables that can produce an output. Leadership system changes, catalysts, limitations, and constraints vary among situations and are communicated differently through common functions (O'Hair, 1996; Yukl, 1998; and Wheatley, 1992).

The study is based on military leadership functions described by Fleishman (1956) and Flannagan (1954), and categorized by critical military leader functions, such as knowledge, decision-making, interpersonal interaction, character, organization over person, policies and records (Yukl & Van Fleet, 1986). Van Fleet (1975) conducted subsequent research on the same functions of military leadership with similar findings.

The macro aspects of these leadership functions fall under Systems Theory, Role Theory, Multiple-Influence Theory, and Substitutes Theory (Bass, 1990; Yukl & Van Fleet, 1986). The Systems Theory approach in this study looks at military leadership in the Army company unit operating in the German theatre of operations, within a specific combat grouping, during Sergeant's Time Training, and assesses leadership through perceptual inputs, performance, and satisfaction outputs (Bass, 1990). Role Theory supports the military leadership perceptual assessments in the fulfillment of expectations of work by providing anonymous feedback to leadership on what was learned and listing potential areas of improvement for leaders (Yukl & Van Fleet, 1986). In the case of Substitutes Theory, efficient leadership assessment is needed to potentially reduce resentment feedback from over-involved leader activities (Bass, 1990; Yukl & Van Fleet, 1986). Multiple-Influence Theory states that military leaders should focus more on macro-influences than micro-variables (Yukl & Van Fleet, 1986). Micro-variables however, do influence leader behavior.

Micro-variables of military leadership efficiency categorized under each of the macro functions could potentially provide a taxonomy to more finely assess leadership as was found in Stratified Systems Theory (Zaccaro, 1996). A broad characteristic of leaders includes an awareness of the situation to adjust to change. Useable, psychometrically sound situational awareness measurement techniques are becoming increasingly important to leadership assessment of change. Situational awareness qualifies as a leader function that adds to the macro functions in assessing the overall leadership dynamic. Foremost, there is the need to assess new military leadership systems and to include situational awareness as a leadership function (Graham et al., 1999).

Measuring, understanding, and interpreting the psychometrics of leadership behavior continues to be the challenge. The heuristic accomplishments of researchers, which theorize between the complex and parsimonious nature of leadership, reveal that the study of leadership requires science. The goal of this macro-scientific approach to this study is parsimony, while understanding the role of complexity and micro-variables. Parsimony, in the case of macro leadership efficiency is best summarized by Maxwell and Delaney (1990):

> [First, the] Lawfulness of Nature... despite its obvious complexity, is not entirely chaotic: regularities and principles in the outworking of natural events exist and wait to be discovered... [Second,] Finite Causation...[states that] it is not necessary to replicate the essentially infinite number of elements operating when an effect is initially observed in order to have cause sufficient for producing the effect again. (pp. 6-10)

The premise of leadership substantiation is to measure the leadership perceptions of leaders and followers. Efficiency has often been used in economics as an indicator, to communicate matching material inputs to successful productive outcomes. Behavioral inputs of the environment can include historical, economic, political, technological, social, and constraints (O'Hair, 1996; Yukl, 1998). Behavioral inputs of the organization can include strategic, functional, cultural, technological, and constraints (O'Hair, 1996; Yukl, 1998). Behavioral inputs of the individual can include traits, skills, values, beliefs, and attitudes (O'Hair, 1996; Yukl, 1998). All inputs can be categorized into the leadership functions of a military system.

This approach views leadership based upon the importance of definitions. "Leadership is viewed as an influence process that occurs naturally within a social system and is shared among its members" (Yukl, 1998, p. 3). Efficiency as defined, "is directly producing an effect or result, product causative, with minimum effort, expense, or waste; or the ratio of the useful energy delivered by a dynamic system to the energy supplied to it" (WWWebster, 2000). Leadership efficiency can then be defined as the measurement of an influence process to determine minimum effort, expense, or waste that occurs naturally within a social system and is perceptually shared among its members (Yukl, 1998; WWWebster, 1999). The military leadership efficiency ratio of the useful behavioral energy delivered by a unit's leadership system to the behavioral energy supplied to it, could then be used as an indicator for future leadership training.

Measuring behavioral leadership efficiency has not been accomplished. The study will include measures of efficiency applied to psychometric measures of soldier and leader perceptions. Measurements will include actual or current leadership function perceptions among the ranks, and desired or ideal leadership function perceptions and satisfactions. The difference between what is and what is desired will result in an efficiency correlation.

Studies in the military confirmed that combat and noncombat conditions require different patterns of leader behavior (Gal & Mangelsdorff, 1991). Such differences are likely to vary by the ranks of soldiers in the Army. Up the chain of command and peer influence in the military leadership system can influence the accomplishment of missions, as well as down the chain of command influence (Van Fleet & Yukl, 1986).

The purpose of a military leadership efficiency indicator is to provide feedback to leaders and followers to improve leadership through perceptual awareness in different situations. A limitation to the study includes interruptions to training due to operational missions. Operations, such as peacekeeping and police actions, were not previously included in Fleishman's, Flannagan's, and Van Fleet's research. An issue of concern, among the military, includes the need for strong leadership in a shrinking military that has far more global operational missions with different job requirements than in previous decades (Department of Army, 2000). Military leaders are placed in positions of accountability, unaware of the impact of their leader activities on soldier team development. An important starting point is to provide leaders with macro-efficiency measurements, which may provide vital feedback to military organizations for the continuation, cessation, or adaptation of leadership practices.

CHAPTER 2

Review of the Literature, Rationale, and Hypothesis

Military Leadership

Military leadership focuses on the successful completion of Army missions (Department of the Army, 1999). The direction the military takes towards leadership tends to lean towards the organizational, group, or team leadership perspectives. Confounding this group leadership direction is the training of individual leaders within the organization. The military doctrine splits leadership into direct, organizational, and strategic (Department of the Army, 1999). Military leadership falls situationally under four areas, individual, group or team, organizational, and environmental (Department of the Army, 1999; O'Hair, 1996). Within each area, leadership functions operate differently. It is important to identify specific leadership functions common to all four areas to establish a proper framework of analysis.

Considering the four areas of leadership within the military, the military grapples with a plethora of assessment tools trying to identify the actions of "good" effective leadership within certain situations. Explaining key terms is important to understanding assessment direction. First, the difference between managers and leaders needs to be established. Phillips (1992) emphasized MacGregor Burns' views on the following:

> Leadership is leaders inducing followers to act for certain goals that represent the values and the motivations—the wants and needs, the aspirations and expectations—of both leaders and followers, and the genius of leadership lies in the manner in which leaders see and act on their own and their followers' values and motivations. (p. 3)

Most often management and leadership terms, which have separate implications, are used interchangeably with no regard to meaning. Yukl (1998) mentions an inconclusive difference, suggests further empirical research, but offers no systematic definition to discriminate between the two terms. Bass (1990, p. 386) makes a sharp distinction but creates an in-depth argument between the two terms, for simplicity sake, "leaders are drawn towards the [interpersonal relationships or] discretionary activities beyond position requirements to obtain objectives or goals, while managers rely on organizational objectives [or tasks] mandated by organizational policies." Therein lies a framework issue that managers, management, leaders, and leadership within organizations must face, that leaders lead people and managers manage objectives/tasks.

The analytic questions for researchers and organizations are often what is the best possible lens used to look at leadership and what do the individuals and organizations value. Hershey, Blanchard, and Johnson (1996, p. 144) propose a difference in the foci between observation and measurement, and state that "efficiency is doing things right" while "effectiveness is doing the right things". The bias is truly towards effectiveness, moreover organizational effectiveness, and Hershey, Blanchard, and Johnson (1996) do not elaborate on the concept of efficiency. However, Moore (1995) addresses management efficiency in-depth with regard to material resources, such as monetary distribution of tax revenue, task priorities, and administration. This study frames efficiency one step further, not materially "things right" but behaviorally "amount right", the efficient acting upon values through behavioral leadership functions instead of only viewing efficiency as merely material, task, or resource feasible. Moore (1995) clearly identifies the creation of individual and public/group values, satisfactions, desires,

aspirations, adaptations and engagements, thus opening the possibility of empirical measurement of these perceptions. Leaders can then discretely measure proper amounts according to the situation, to save on a leader's behavioral resources.

Moore (1995) suggests that in determining what is valued in followers and leaders, normative questions should be raised about the value of leader efforts, and to develop an analytical apparatus or feedback mechanism to answer research questions. Adaptive feedback information is a requirement for the military to maintain steady state (Harris, 1993). Once proper measurement assessment or feedback techniques are in place, researchers can check for valid and reliable leadership patterns.

The military's definition of leadership is as follows, "Leadership is influencing people—by providing purpose, direction, and motivation—while operating to accomplish the mission and improving the organization." (Department of the Army, 1999, p. 1-4). Wildavsky (1985) argues the existence of patterned relationships, between followers and leaders, rests with the organization's leadership style. Military leadership doctrine suggests that the ideal organizational leadership style for military leaders is a combination of transformational and transactional styles of leadership (Department of the Army, 1999). Yukl (1998) supports Bass' (1985) transformational leadership definition,

> the definition of transformational leadership is the leader's effect on followers: they feel trust, admiration, loyalty, and respect toward the leader, and they are motivated to do more than they are originally expected to do, ...to transform and motivate followers it involves making followers more aware of task outcomes, inducing them to transcend their own self-interest for the sake of the organization or team, and activating their higher order needs. (p. 325)

Bass (1998) supported Gal's (1987) view that, "The older models of leadership of path-goal or trait leadership did not address the needs for soldier and officer commitment that could be met by the newer model of transformational leadership" (p. 20). There is an argument that transactional leadership, though supported by the military as a leadership style, is part of transformational leadership and vice versa. For example, the aesthetic pleasure a supervisor receives from the professional development of a subordinate, could be considered transactional or transformational. According to Phillips (1992), military leaders must rely on soldier perceptions to aide and set guidelines for sound leadership practices. Within the transformational leadership context or military leadership system, efficient leadership measurement through leader and follower perceptions is desirable.

The military leadership system, or macro military leadership, is composed of fundamental and changing patterns, functions, and environments. A leader contends with the difficulties of interpretation, change, and constraints. Determining the military leadership efficiency factor is based on the significant functions, characteristics, and factors of military leadership. The theories, both macro and micro approaches, clearly identify significant leadership styles, characteristics, and functions. The individual, organizational, and environmental leadership identifications dramatically increase awareness (O'Hair, 1996). However, this type of awareness gives little guidance or pathways as to the amount of improvement a leader or group of leaders must provide for a given situation in time. As a result, researchers have paid more attention to certain aspects within each of the identifications often ignoring the holistic context of leadership among situations (Pawar & Eastman, 1997), lending existing measures of leadership

unsuitable or untimely to assessment and military leadership training (Zaccaro et al., 1999).

The Leadership Functions

Yukl and Van Fleet (1986) reviewed the critical incident technique performed by other researchers in the classification of leadership behaviors, which lends itself to the subsequent comparisons of studies using similar schemes. The macro-approach to leadership in previous research made some correlations and identified significant functional leadership behaviors in military and civilian business environments (Van Fleet and Yukl, 1986). "Flannagan (1951, 1954) analyzed nearly 3,000 incidents for a military organization. Williams (1956) obtained over 3,500 incidents for business executives. Those incidents led to the development of six broad functional categories for classifying or describing military leader behavior" (Van Fleet and Yukl, 1986, p. 22). The categorical functions are knowledge, decision-making, interpersonal interaction, character, organization over person, policies and records (Van Fleet and Yukl, 1986). Another function not listed in Van Fleet and Yukl's (1986) research, but equally important is situational awareness (Graham et al., 1999). In the context of situations, which flow from one pattern to another, environmental situational awareness categorizes as a leadership function to cope with environmental, organizational, and individual, changes and constraints.

Situational awareness function. The change phenomenon affects all organizations. Noticing changes within an environment is a task of situational awareness as a function of leadership (Burba, 1999). The transformational leader is concerned with long-term and short-term change to meet the needs of a situation and the people involved in the event

(Trott & Windsor, 1999). There is a need to continue situational awareness research, to avoid inefficient behaviors, to provide much needed and up-to-date feedback to soldiers and leaders in the field, and to develop assessments that allow military leaders to efficiently adapt behaviors from perceptual cues to avoid adverse consequences and continue productive leader behavior (Burba, 1999).

Knowledge function. The knowledge leadership function contains micro variables such as skills, technical competence and proficiency in a military occupational specialty. Military leaders must allow for the evolution of training systems and maturation of soldiers to allow for increases in cognitive competence (Herschbach, 1997). Task competence, intelligence, and practical knowledge are key ingredients for successful leaders and add credibility to leader behaviors and actions (Bass, 1990).

Decision-making function. The decision-making leadership function contains micro-variables such as planning, management, and execution. "The decision-making process is the sum total of all the tools--those derived from conscious and automatic processing... --that the leader and soldiers use to arrive at a decision about present, near term or future operations" (Maggart & Hubal, 1999, p. 6). The military operates within the context of hierarchic-bureaucratic structure which supports a centralized decision-making system with distinct levels of authority (Department of the Army, 1999; Novelli & Taylor, 1993).

Military leaders at all levels must also deal with unforeseen events and problems that disrupt the work, reduce efficiency, and require modification of plans. It is important to ascertain the processes in military leadership behavior to improve upon the models that most appropriately fit the decision-making function (Pew et al., 1998).

Interpersonal interaction function. The interpersonal interaction leadership function contains micro-variables such as communications with superiors, peers, and subordinates. A military unit is characterized by the interaction leadership function of its members, and will be affected by the turnover within the unit as a result of new membership (Wildavsky, 1985).

Conflicts among soldiers arise within the realm of interpersonal interaction, but most often arise as to the state of the environment or tangible shortcomings. "These acts seem to be due to unresolved grievances about impersonal conditions, such as slow demobilization, poor food, unacceptable discipline, or unfair discrimination, rather than from individual resentment" (Bass, 1990, p. 299).

The leader-follower interaction includes the transfer of information, such as intentions, emotions, or ideas, through communication (Harris, 1993). Communications is a major component of interpersonal leadership function (Department of the Army, 1999). "Interpersonal communication is defined as a process involving both purposive and expressive messages composed of multiunit and multilevel signals that depend on the context for their meanings interpreted by the interactants" (Harris, 1993, p. 286). Communication applied to military leadership doctrine symbolizes a perspective to assist in explaining relationships and diagnosing relationship patterns.

Character function. The character leadership function contains the micro-variables such as personality, traits, values, and beliefs among the individual. Past research suggests that there are distinguishing traits between leaders and nonleaders, however there are no traits that consistently relate to leadership (Van Fleet and Yukl, 1986). Leadership traits seem to be a function of systems theory, in that all characteristics and

combinations of characteristics are important, however combinations vary across situations (Van Fleet & Yukl, 1986).

Military leadership personalities also vary among individual and group dispositions in self-confidence, emotional maturity, emotional stability, energy level, and stress (Yukl, 1986). This confirms the importance of the character function in leadership. Most of the empirical research on personalities shows that leaders who have control over their emotions handled situations better (Bass, 1990).

The Army core values are loyalty, duty, respect, selfless service, honor, integrity, and personal courage, and apply to all situations (Department of the Army, 1999). Values influence an individual's preferences, perceptions, and choices, affecting behavior (Yukl, 1986). In military situations, the members of a unit will choose certain behaviors based upon personal and organizational values, if it is not otherwise directed by orders or regulations (deLeon, 1994).

"The term skill refers to the ability to do something in an effective manner" (Yukl, 1998, p. 235). There are skills, such as technical and conceptual skills, that are important to military leadership (Singer et al., 1997). The skills research approach has a common overlapping identification among researchers. "The need to develop and implement solutions with and through others places a premium on... skills used in acquiring information, framing actions, and promoting coherent actions on the part of the group" (Zaccaro, et al., 1999, p. 8).

"Belief is the mental acceptance of something as true, even though absolute certainty may be absent" (WWWebster, 1999). Often beliefs hold a leader's reality, which affects decision-making. Common problems associated with beliefs are the

presence of bias, the constraints or limitations for creative thought, and the acceptance or filtering of new information within the organization.

Organization over person function. The organization over person leadership function contains micro-variables such as organizational influence, adaptation on the job, group norms, and history. Organizational affiliation establishes some of the behaviors practiced by groups and individuals. "Norms prescribed how to behave under different circumstances, how to treat different questions" (Hershey, Blanchard, & Johnson, 1996, p. 548).

The adaptation on the job demands individual/group production results. Most leader decisions are based on the economic production function. Adaptations come in the form of conforming to leader and group norms and changes in job duties. In line with Moore (1995), adaptations within an organization are the creation or adaptation of group norms towards a common or organization value (Hershey, Blanchard, & Johnson, 1996).

The military has strict definitions of it's training tasks, by setting a task, condition, and standards to most actions within the organization (Department of the Army, 1990). The military is dependent upon the unit's ability to develop a path to skill proficiency, and the leader's ability to define those tasks, goals, and paths to proficiency (Bass, 1990). Events in an organization's history often shape, mold, or influence leader and individual decisions based off patterned organizational norms and values.

Policy and records function. The policies and records leadership function contains micro-variables such as coordination and integration activities, and the handling administrative details. The military or transformational leader administers policies, to

maintain the status quo within the context of good order and discipline by the position and responsibility each member is assigned (Trott & Windsor, 1999).

In contrast to Roberts' (1997, para 5) claim of manager responsibilities, "[Leaders] oversee uniform policies that cover rights and duties, promotions based on competence and merit, and impersonal role relations to ensure the smooth flow of work", in order to provide the context of how to operate within a organization, while managers prioritize, issue, construct, and complete the policies in question.

Leaders formally establish policy to set expectations for soldiers, performance standards, and acceptable behaviors within the military ecosystem. Roberts (1997) made an intriguing distinction between efficiency (internal operations) and effectiveness (external adaptation), however the distinction between leadership and manager was not clearly defined or separated. Leaders have the responsibility to set the parameters of behavior with administrative policy and to obtain records of feedback based on the perceptions of soldiers.

Feedback Mechanism

To understand the subtle differences between leadership efficiency and other leadership research, paradigm shifts in thought are required. "Since separate situations make different demands on leaders, A. Bayelas, suggested that we must try to 'define the leadership function that must be performed in these situations and regard as leadership those acts which perform them'..., A. Paul Hare has concluded that...'there are more differences between situations than between [leadership styles]'"(Wildavsky, 1985, p. 89). Wildavsky (1985) also stated the situation was composed of the individual, group,

organizational, and environment, in support of O'Hair (1996), and emphasized that perception is the lens at which leadership can be measured.

Leadership effectiveness research differs from leadership efficiency in the lens at which leadership impacts the situation. Leadership effectiveness by definition always falls short of optimal or perfect leadership for a situation at a given point in time. According to (Yukl, 1998), leadership effectiveness definitions, outcomes, processes, and objectives differ by writer perspectives, however it can be surmised that if researchers are unaware of the continuum at which leaders and followers operate in a certain situation, a vague effectiveness diagnosis can be applied as to the impact to or outcome of the situation.

Conceptual leadership efficiency measures both the deficient and excessive efforts in general identifiable leadership functions on behalf of the leaders. The after-action review is the official primary feedback mechanism for leaders and followers in the military (Department of the Army, 1990). Singer et al. (1997) emphasizes the importance of providing feedback, but leaders must be aware of the constraints, such as a soldier's apprehension to point out corrections to dominant leaders or the unwillingness of leaders to become aware of their own flaws.

"There has been little research to evaluate the benefits of after-action reviews for increasing leadership development. Additional research is clearly needed to determine the conditions and procedures appropriate for using after-action reviews to improve leadership skills and processes." (Singer et al., 1997, p. 114)

Research Implications

Leadership efficiency factor measurements can improve leadership in similar military situations. During familiar after-action reviews, leaders can obtain anonymous feedback from both soldiers and units, on the overall perceived actual satisfaction from the ideal satisfaction of the accomplished unit mission. The feedback tool is important in closing the gap between subordinate perception, leader self-perception, and team perception (Trott & Windsor, 1999). The process for getting such feedback must be thorough, quick, and provide an analysis pathway for a leader to become more aware and to undertake leadership improvement. The research and survey instrument can easily be adapted to the civilian corporate sector under these leadership functions (Van Fleet and Yukl, 1986).

The mechanism of this study is to introduce a "real time" tool for obtaining feedback from leaders and followers regarding the efficiency of military leaders. Obtaining this feedback will eliminate some subjectivity, based on soldier groupthink, the leader's own views of the unit's leadership climate, and changing soldier leadership perceptions. The data this tool could possibly generate would provide the military leader with identified leader functional areas for growth based on soldier perceptions. (Trott & Windsor, 1999)

While results will vary from leader to leader, it is key for leaders to understand that the leader perception of the soldiers is a reality they need to address. "Perception is the mental process we use to select, organize, and evaluate stimuli from the external environment to mold them into a meaningful experience" (Hershey & Blanchard, 1996, p. 355). The learning gained from a preliminary leadership screening can identify under-

and over-compensation efforts in leadership functions. Through these indications further micro-variable research in each of the leadership functions could identify underlying remedies to improve or decrease efforts in certain leadership functions. Nonetheless, in all situations the macro-viewpoint allows a preliminary diagnosis of leadership actions and learning. Researchers can make a more distinct micro-diagnosis along the continuum that can lead to further leader behavior modifications, awareness, and learning.

Unit of Analysis and Conceptual Framework

To put into perspective the framework, a brief synopsis is required to properly describe the unit of analysis. First, a proper identification of terms needs to be made so not to convolute meanings. Terms, such as leadership efficiency, feedback, leadership, and after-action review, were identified previously. Second, context demands a conceptual review of a leader's actions as prescribed by modifying Hermalin's (1995) efficiency model and Hershey, Blanchard, and Johnson's (1996) situational leadership model. Third, leadership functions common to all areas; individual, organizational. and environmental, O'Hair (1996) set forth the parameters to measure leadership situations represented by modifying the Deming Model (1986).

Conceptual Review

An economic approach can be used to measure the efficiency of inputs versus outputs in regard to the production function is modified to measure the psychometric leadership efficiency, leader and follower diminishing returns, leadership constant and variable returns to scale, and variable follower tolerance envelopes.

Hermalin (1995) sets forth the conceptual foundation of leadership efficient measurement and the possibilities that can emerge. If efforts of both leaders and

followers match optimally and the objective is unattainable by those efforts, maximum leadership efficiency has been attained. This was proposed by Moore (1995, p. 72) as "the possibility citizens and overseers were happy but unable to produce anything of value." If efforts of both leaders and followers match optimally and the objective is attainable by those efforts, maximum leadership efficiency has been attained. Any objective unattainable in the red in (Figure 1) or unattained through the lack of worker or leader efforts (Hermalin, 1995), can be perceived as inefficient leadership. The attainable goal must hit that point on the curved continuum to become ideal efforts. Any lack of leader efforts can induce a lack of worker efforts thereby causing inefficient leadership. Also any unsolicited leader efforts, such as "micro-management" actions or better termed as inefficient leadership actions, can cause a lack of worker efforts. However, if worker efforts drop without regard to leader efforts, the worker sacrifice would move the continuum (curve) lower causing effort sacrifice, making an attainable goal unattainable. Note the slightly higher worker effort at the beginning of the leader effort, this supports the legitimate power theory (Bass, 1990). Another question posed, is there a "mirror" effect of too much leader intervention? The dashed line could represent that decrease in worker effort.

Perceptions can then be measured through the leadership functions to identify inefficient leadership efforts. The displayed the over- and under-compensation leader efforts as perceived by leaders and followers, suggest improvement in those areas. The modified Deming control schematic from Walton (1986), (Figure 2) measures the composite means of that leadership function close to the ideal average.

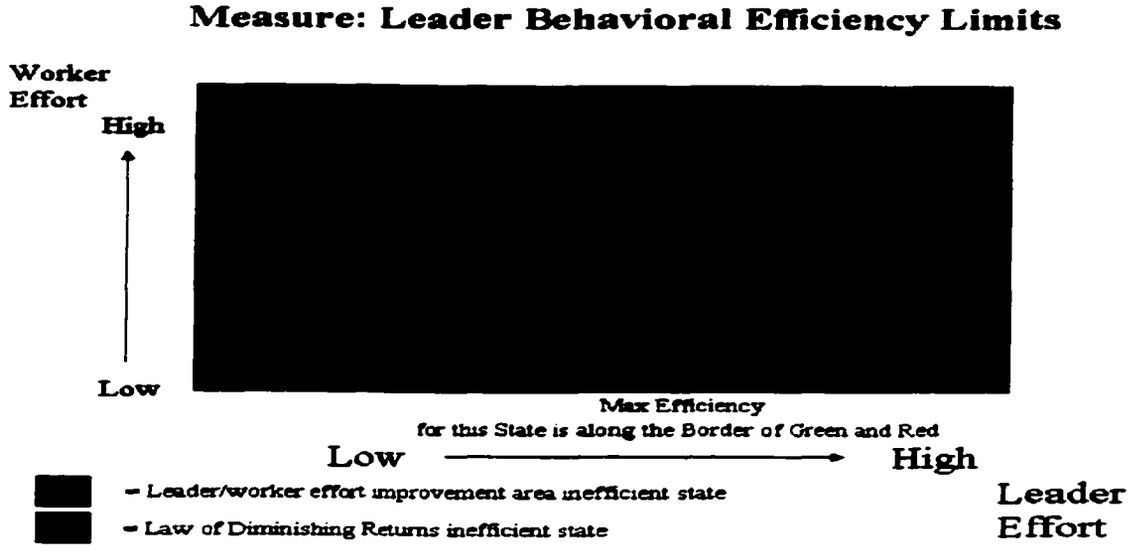


Figure 1. Continuum of Leader and Worker Efforts.

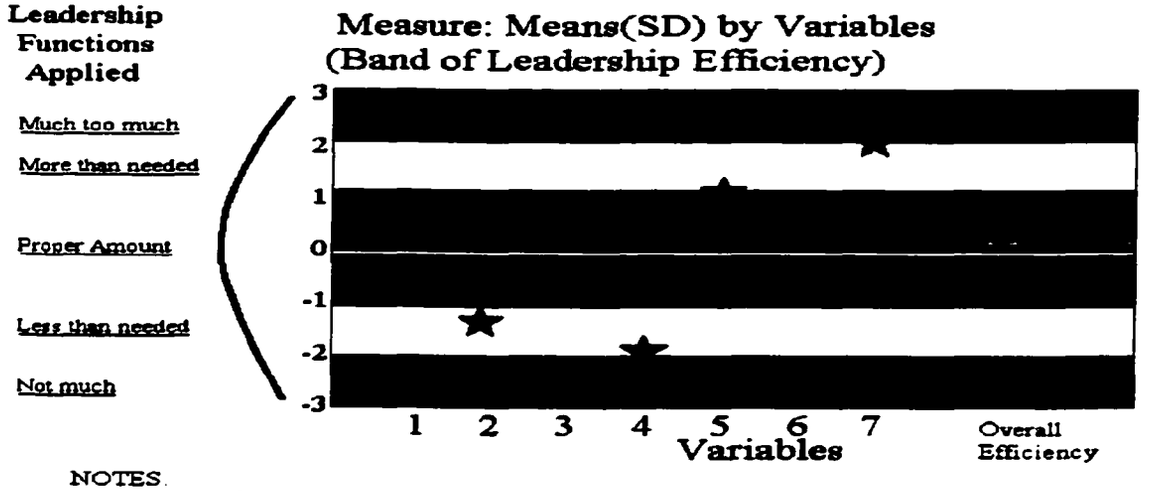


Figure 2. Composite Mean of each Leadership Function from the Optimal Mean.

Another portrayal of leadership efficiency based on the two previous conceptualizations would be to depict the sequence of values (productivity) drawn from the closely related random variables (leadership functions). The stochastic leadership efficiency curve could serve as an indicator to potential leadership problems and provide a snapshot of organizational direction. See Figure 3.

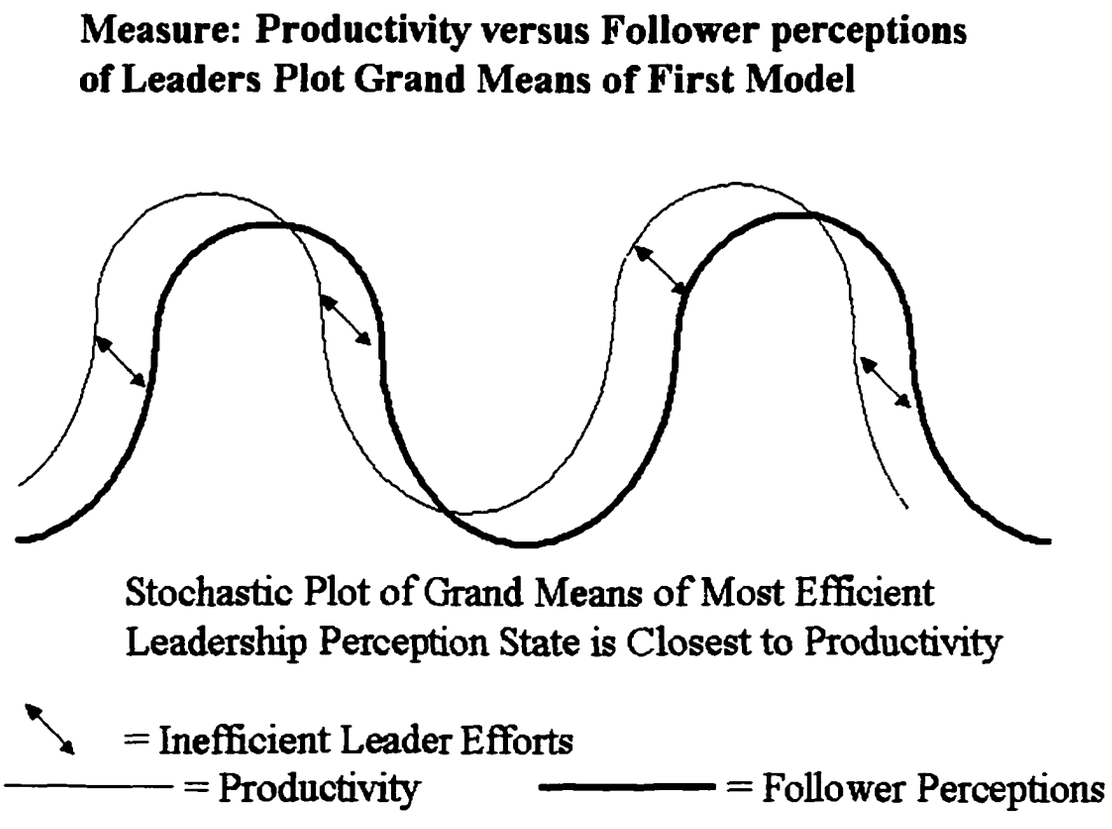


Figure 3. Potential Stochastic Plot: Productivity versus Efficient Leadership State.

The modified Hershey, Blanchard, and Johnson (1996) model (Figure 4) compares effective and efficient leadership. The original model listed four quadrants important to the graphic depiction of a leadership situation on the continuum. The two

quadrants on the left were then subdivided further to include overcompensation efforts. The zones were labeled to identify situations common to those points on the continuum within a particular zone. Labels were added to describe each situation.

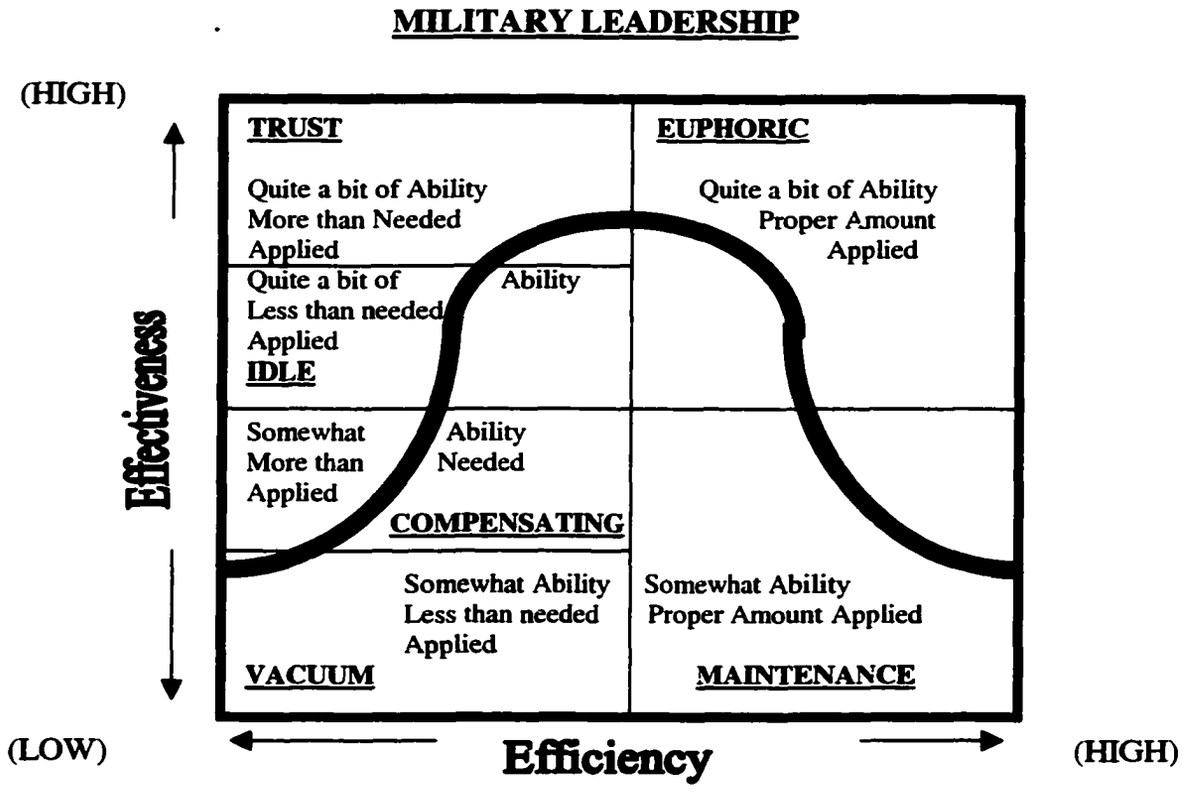


Figure 4. Military Leadership Model Effectiveness versus Efficiency.

Rationale and Hypotheses

The purpose of this study is to determine military leadership efficiency between military leaders and followers from the leader and follower perspectives within units. The efficiency of military leadership is a function of knowledge, decision-making, interpersonal interaction, character, organization over person, situational awareness, policies and records (Van Fleet & Yukl, 1986; Graham, et al., 1999). As soldiers differ in education levels, military occupational specialty, experience, age, and other inputs to

variable situations, their assessments and perceptions of military leadership efficiency should differ.

Both the leaders and soldiers should have an adequate knowledge base to make efficient decisions; the unit and unit leaders must be able to make decisions about specific soldier needs based on the leader's knowledge and available information (Evans, 1999). The leader's communication ability is imperative for communicating intent, motivating soldiers, and remaining up-to-date on situational aspects of the mission. The interpersonal interaction can enable a unit to be more cohesive in completing the mission through communication. A leader's character or personality can be scrutinized by other soldiers. Soldiers usually expect leaders to live up to an ideal where a soldier is comfortable receiving direction from that leader. The organization over the person can affect the soldier/leader interaction based on certain organizational traditions and influences. The behaviors are also guided by traditional group norms and codes of conduct. Since the military is an all-volunteer force, the adaptations on the job become personal challenges to conform and conduct oneself in a specific manner. Soldier and leader behavioral adaptations require a flow of situational information. Situational awareness is the leader's ability to foresee, adapt, and make more accurate decisions during fluid and changing situations (Graham et al., 1999). A leader's ability to deal with change in an efficient manner will most notably reduce uncertainty and increase production. Units often create specific personnel policies and records to provide focus, direction, and often set standards and expectations. Military leadership doctrine suggests a hierarchical structural focus and lists differences in leadership approaches vertically (Department of the Army, 1999). Bass (1990) supports horizontal leadership activities, such as differences in group

leadership in production, marketing, and team-based operations with different job duties. The study would like to determine if horizontal group differences exist among unique military unit groups with different occupational specialties. From a multivariate perspective and within the separate functional abilities of the leadership climate, the variables can be compared to the functional and overall leadership efficiency between the three different types of units.

Ha1: Differences in military leadership efficiency among units can be attributed to knowledge, decision-making, interpersonal interaction, character, organization over person, policies and records, and situational awareness.

Military leadership manuals provide leadership guidance to both officers and non-commissioned officers to assist in leadership performance. Since military leadership increases mission accomplishment and job satisfaction, a macro measurement of situational military leadership takes into account the system's viewpoint of changing and variable inputs and outputs. Though the Army leadership doctrine discourages leader elaboration of actions to the subordinate's satisfaction (Department of the Army, 1999), satisfaction among soldiers should vary as to their perceptions of job, immediate supervisor, leaders in the unit, the unit, and the Army. Overall individual and unit satisfaction can contribute to the unit's leadership efficiency. From a multivariate perspective and within the separate satisfactions among soldiers within the leadership climate, the variables can be compared to the overall leadership efficiency between the three different types of units.

Ha2: Differences in military leadership efficiency among units can be attributed to individual and unit satisfaction with regard to job, supervisor, leaders, unit, and Army.

Each unit has a variety of soldiers assigned to it, with each soldier having different backgrounds to shape their perceptions. Soldiers are assigned a multitude of tasks varying in complexity and type. Feedback is imperative to the production progress of the mission. Soldiers are usually assigned job-specific tasks for which soldiers are trained by contract. The military occupational specialty gives the soldier a basis to perform and assist the Army in completing tasks that require team and group efforts. The contract however, does include tasks for which the soldiers may not be trained, in which the needs of the military clause requires the military to conduct training to fill these experience voids (Department of the Army, 1995, 1999). The interpersonal interaction is a priority to leader awareness of soldier abilities, thus the need for continued individual feedback. As leadership character and awareness differ among leaders, soldiers can provide situational information on their actions. The soldiers may perceive leader actions as inefficient, however through known leadership practices through specific leader functions, leaders can obtain the desired outcome and improve functional performances. The leadership within the organization varies by type of unit and the legitimate rank of members of the organization, directing and guiding soldier viewpoints. From a multivariate perspective and within the separate ranks of soldiers of the leadership climate, the variables can be compared to the unit and overall leadership efficiency between the three different types of units.

Ha3: Differences in military leadership efficiency among soldiers can be attributed to rank and type of unit.

As the soldier and leader's awareness increases, the efficiency measurement through anonymous feedback provides a potential foundation for unit leaders to focus on specific leadership approaches, techniques, and resources. Time saved in directing limited leadership resources can allow for more resource efficient completion of assigned missions. The differences in efficiency and effectiveness should become perfectly clear. Macro efficiency assessment tools of this sort will assist leader and follower interaction awareness, moreover leading to even more efficient micro leadership assessments and diagnoses of areas of improvement. Change and evolving processes affect efficiency research, but once components, functions, and characteristics have been identified, strives in efficiency should continue to improve the overall production function. No assessment on leadership efficiency exists (Impara & Plake, 1998).

CHAPTER 3

Methodology

Overview

The causal comparative method outlined by Gall, Borg, and Gall (1996), will be used in this study. The method aids the study in attempting to discover possible causes and effects of leadership behavior patterns. It can be assumed in this study, that the causes are studied through assessment after they presumably have exerted their effect in the training environment. Since the researcher is unable to manipulate the units and ranks in any way during this training, the only recourse was to observe the effects of natural variations in leadership. The natural variations mean that the variations in leadership functions between units and between ranks were observed under the conditions that did not involve any artificial arrangement or manipulation by the researcher (Cook & Campbell, 1979). The population will be drawn from active Army units located in the Republic of Germany. The sample consists of 15 company-sized units.

Minimal selection bias was reasonable due to the Army's assignment of personnel, for both enlistment and retention, to units for the sole purpose of filling job vacancies based on rank, job specialty, and the needs of the Army (Department of the Army, 1995, 1999). However, this is not perfectly minimized. Reenlistment incentives offer some soldiers who meet certain criteria and who have served 2, 3, and 4-year terms location choices for their next duty assignment. The location choices must also have job openings to meet the rank and job specialty of the reenlisting soldier. Other factors causing selection bias include; compassionate reassignments, solders who are absent without leave or on leave, units operating at different personnel authorizations, different

personnel shortages at different parts of the world, equal opportunity policy population distributions, soldiers discharged for misconduct or failing to meet training standards, and those soldiers not available due to operational missions, schools, or other training events. All of this limits the generalizability of the study, though all of these situations impact the entire Army at different times.

A constructed survey instrument was used to determine leadership functional abilities, satisfactions, and leadership efficiency measurements. Military leadership efficiency is defined as a composite of knowledge, decision-making, interpersonal interaction, character, organization over person, policies and records, situational awareness, and quantifiable information measures. A pilot study was run, followed by revisions in the final assessment. See Appendix D and E.

Leadership Training Background

The leadership assessment currently used by Army companies, is the command climate survey, administered once during an assessed one or two year period in a company within the company commander's tour of duty (Department of the Army, 1986, 1994). The results are often untimely. Results of past Army company command climate surveys for this study were unavailable for comparison. Several leadership situations, often different in nature, are presented and then the soldiers are asked to recall generalities over an entire one-year period. Often the assessments have become general "popularity" assessments instead of assessing critical leadership functions situationally to produced outcomes.

Leadership efficiency has not been previously studied in relation to military leadership. Training is the often studied in lieu of leadership efficiency, and it is a natural

control for the study due to its consistency. By Field Manual 25-100, the unit is required to conduct training weekly (Department of the Army, 1988). After training is completed, the After-Action Review (AAR) is conducted to assess the execution training but not leadership functions (Department of the Army, 1988, 1990). The survey and consent form format and design were based the communication feedback model (Ledlow, 1999). This model suggests the proper placement of demographic items, possible item scales for targeted military populations, a military feedback orientation, a situational non-intrusive assessment format, and aids access into military populations with a University of Oklahoma IRB and military approved approach to consent forms.

Setting

The researcher obtained assessments by personally administering all surveys after the unit's training event. Access was given by company commanders with written permission that guaranteed unit and individual anonymity with no risk or benefit of participation. The researcher explained the study to the company commanders and first sergeants from every unit, and both were excluded in order to obtain unit assessment access. Soldiers signed individual consent forms that guaranteed anonymity and included a no risk or benefit participation statement. Few soldiers had to be reassured of anonymity, and the researcher removed the consent form from the survey to emphasize the anonymity. The pilot survey data were obtained on 7 June 2001. A statistical power analysis was done in accordance with Cohen (1988) power procedures.

Participants Pilot Survey

The pilot survey obtained a sample n=35 of participants from the unit. Demographics were analyzed by descriptive statistics. Table 1 shows the group distribution of pilot survey participants. See Appendix D for Pilot Survey.

Table 1. Combat Arms Unit Distribution.

Gender	**Frequency**	**Race**	**Frequency**	**Education**	**Frequency**
Male	32	White	22	Attended High School/GED	2
Female	3	Black	8	Completed High School/GED	21
Marital Status	**Frequency**	Native American	0	Attended Vocational College	3
Married	18	Asian	0	Completed Vocational College	0
Single	17	Hispanic	4	Attended Undergraduate College	5
Rank Group	**Frequency**	Another Race Type	1	Completed Undergraduate College	4
Soldier	27			Attended Graduate College	0
NCO	7			Completed Undergraduate College	0
Officer	1				

Pilot Survey Results

The pilot survey Cronbach's Coefficient Alpha reliability computations were computed. The prior leader training abilities reliability for the odd questions 1-13 was .87 for the raw variables. During-leader-training abilities reliability for the even questions 2-14 was .91 for the raw variables. How the leader applied functions reliability for the questions 15-21 was .92 for the raw variables. Satisfaction measures reliability for questions 11-15 page 2 was .84 for the raw variables.

Pilot survey participants' ages ranged from 18 to 41 years with a mean of 25, median of 25 years of age, and mode equal to 26 years of age. The response rate was

100% and an item response rate was 100%. The researcher checked for completeness, and if incomplete asked the participant whether or not they wished to respond. Questions were raised by three individuals as to the anonymity of the survey, and the researcher assured the participants of no risk of participation. None of the respondents had taken this survey before and responded as such.

Pilot responses to the unit type item contained 60% error in perception, 21 out of 35 respondents choose another unit type than the one they belonged to. Due to the potential invalidity of this item the researcher coded the actual unit type. All of the military personnel who listed they had children indicated the number of children they had. Fourteen different military occupation specialties (MOS) were represented. Thirty four percent of the participants made a suggestion to improve the leadership within the unit. Only three participants made suggestions to improve the survey. One respondent believed that soldiers are not privy to the administrative activities of leaders within the unit, and suggested that a Not Applicable (N/A) response, should be added. One respondent wanted more time to prepare. One respondent had difficulty discriminating from a one-leader perspective to a combined leader perspective. The survey time completion was approximately 10-15 minutes.

A factor analysis using variance rotation revealed cumulative eigenvalues of .88, .99, and 1.04 with 3 factors accounting for 89%, 10%, and 5% of the variance respectfully. Table 2 shows the "leader applied the functions" factor analysis of pilot survey questions 15-21 with factor=3.

Table 2. Factor Analysis Factor Pattern Coefficients of Pilot Survey Participants.

Variables	FACTOR 1	FACTOR 2	FACTOR 3
Leader Knowledge Applied	.78	.29	.16
Leader Decision-Making Applied	.76	.43	.37
Leader Interaction Applied	.40	.71	.22
Leader Character Applied	.69	.15	.38
Leader Organization Applied	.37	.30	.72
Leader Situational Awareness Applied	.42	.58	.63
Leader Policy and Records Applied	.19	.72	.59

The first factor analysis, knowledge, decision-making, and character defined factor one the most, with similar weighting. This suggests leadership knowledge, decisions, and personality impact heavily the leadership efficiency variance in factor one. Other similar weights in factor one included interaction, organization, and situational awareness, while policy and records did not define factor one. Interpersonal-interaction and the policy and records defined factor two the most, with similar weighting. This suggests leadership communication and administrative application impact heavily the leadership efficiency variance in factor two. Other similar weights in factor two included knowledge, decision-making, organization, and situational awareness, while character did not define factor two. Organization-over-person, situational awareness, and the policy and records defined factor three the most, with similar weighting. This suggests leadership higher-headquarter influence, awareness to change, and administrative application impact heavily the leadership efficiency variance in factor three. Other similar weights in factor three included, decision-making, and character, while knowledge and interaction did not define factor three.

After the pilot survey was administered, results obtained and reported, survey item adjustments were made. Survey questions 2-14 even were changed to reflect the

perception of the leadership abilities during the actual training event at the recommendation of the committee. Questions 2-14 even were made similar to the prior abilities questions 1-13 odd. Response categories were changed for the applied leader functions at the recommendation of the committee. "Not enough" and "Not at All" were changed to "Less than needed" and "Not Much" respectively.

Five overall validity questions were added to test the hypotheses. An overall prior ability question was added to test the construct validity of the composite mean of all prior ability items. An overall during-ability question was added to test the construct validity of the composite mean of all during-ability items. An overall prior-efficiency ability question was added to test the concurrent validity of the composite mean of the seven leadership application items and the overall efficiency measure item. An overall during-efficiency ability question was added to test the concurrent validity of the composite mean of the seven leadership application items and the overall efficiency measure item. An overall efficiency question was added to test the concurrent validity of the composite mean of the seven leadership application items.

Design and Variables

The casual comparative study was the relationship of leadership efficiency, satisfaction, the military unit, rank, training event, and leadership functional abilities. The situation is a common training event (sergeant's time training) mandated by regulation and conducted by every unit weekly not in an operational mission. All models are constructed around this common situation or training event. The first model, military leadership efficiency among units can differ depending on type of unit and seven functional abilities both prior and during. Figure 7 on page 45 shows the conceptual

model of leadership efficiency by unit (3 levels) and abilities (7 levels). The second model, military leadership efficiency among units can differ depending on type of unit and different satisfaction indices. Figure 10 on page 48 shows the conceptual model of leadership efficiency by unit (3 levels) and satisfaction (5 levels). The third model, military leadership efficiency among soldiers can differ depending on type of unit and rank. Figure 12 on page 50 shows the conceptual model of leadership efficiency by unit (3 levels) and rank (3 levels). The variables listed in this study are measured as nominal, ordinal, and ratio.

Dependent Variables

The dependent variable is military leadership efficiency, measured as the mean of seven functions of leadership. These seven functions are defined in the literature specifically by Van Fleet & Yukl (1986) and Graham et al. (1999). The dependent variables were assessed by survey instrument designed by the researcher for this study. The seven functions of leadership are: 1) knowledge 2) decision-making 3) interpersonal interaction 4) character 5) organization over person 6) situational awareness 7) policies and records. A factor analysis was used to determine weighting among leadership functions. The leadership efficiency dependent variable (y1) is the composite mean of the seven variables listed above. A rescaled dependent variable (y2) will be constructed to distinguish between efficient and inefficient leadership within the unit and to measure the degree of inefficiency. This rescaling is achieved by recoding item values of four and five on the Likert scale to two and one respectively, indicating the degree same degree of inefficiency from the proper amount, coded 3.

Independent Variables

Prior Abilities. The prior perceptions of soldiers are important in determining any perception predisposition. 1) *Prior knowledge ability* is the assessment of individual soldier perception of a unit's leader's knowledge prior to the common training event. 2) *Prior decision-making ability* is the assessment of individual soldier perception of a unit's leader's planning, management, and execution decision-making prior to the common training event. 3) *Prior interaction ability* is the assessment of individual soldier perception of a unit's leader's communication prior to the common training event. 4) *Prior character ability* is the assessment of individual soldier perception of a unit's leader's personality prior to the common training event. 5) *Prior organization ability* is the assessment of individual soldier perception of a unit's higher headquarters influence prior to the common training event. 6) *Prior situational awareness ability* is the assessment of individual soldier perception of a unit's leader's situational awareness to identify potential changes prior to the common training event. 7) *Prior policy and records ability* is the assessment of individual soldier perception of a unit's leader's administrative abilities prior to the common training event. 8) *Prior overall ability* is the assessment of individual soldier perception of a unit's leader's overall ability prior to the common training event. The variable acts as a construct validity test of the overall leadership effectiveness theory computed by the mean of the seven leadership abilities. 9) *Prior overall efficiency* is the assessment of individual soldier perception of a unit's leader's efficiency prior to the common training event. The variable acts as a concurrent validity test of the overall leadership efficiency and effectiveness theory computed by the

mean of the seven leadership prior abilities against the mean of seven leadership functions.

During Abilities. The during perceptions of soldiers are important in determining any perception in real time. 1) *During knowledge ability* is the assessment of individual soldier perception of a unit's leader's knowledge during to the common training event. 2) During decision-making ability is the assessment of individual soldier perception of a unit's leader's planning, management, and execution decision-making during the common training event. 3) *During interaction ability* is the assessment of individual soldier perception of a unit's leader's communication during the common training event. 4) *During character ability* is the assessment of individual soldier perception of a unit's leader's personality during to the common training event. 5) *During organization ability* is the assessment of individual soldier perception of a unit's higher headquarters influence during the common training event. 6) *During situational awareness ability* is the assessment of individual soldier perception of a unit's leader's situational awareness to identify potential changes during the common training event. 7) *During policy and records ability* is the assessment of individual soldier perception of a unit's leader's administrative abilities during the common training event. 8) *During overall ability* is the assessment of individual soldier perception of a unit's leader's overall ability during the common training event. The variable acts as a construct validity test of the overall leadership effectiveness theory computed by the mean of the seven leadership abilities. 9) *During overall efficiency* is the assessment of individual soldier perception of a unit's leader's efficiency during the common training event. The variable acts as a concurrent validity test of the overall leadership efficiency and effectiveness theory computed by the

mean of the seven leadership during abilities against the mean of seven leadership functions.

Leadership Application. The perceptions of soldiers are important in determining unit's leadership application. 1) *The knowledge function* is the assessment of individual soldier perception and how much a unit's leader's knowledge was applied to the common training event. 2) *The decision-making function* is the assessment of individual soldier perception and how much a unit's leader's planning, management, and execution decision-making applied to the common training event. 3) *The interaction function* is the assessment of individual soldier perception and how much a unit's leader's communication was applied to the common training event. 4) *The character function* is the assessment of individual soldier perception and how much a unit's leader's personality was applied to the common training event. 5) *The organization function* is the assessment of individual soldier perception and how much a unit's higher headquarters influence was applied to the common training event. 6) *The situational awareness function* is the assessment of individual soldier perception and how much a unit's leader's situational awareness to identify potential changes was applied to the common training event. 7) The *policy and records function* is the assessment of individual soldier perception and how much a unit's administrative abilities were applied to the common training event. 8) *The overall leadership efficiency* is the assessment of individual soldier perception and how much a unit's leader's overall leadership was applied to the common training event. The variable acts as a construct and face validity test of the overall leadership efficiency theory computed by the mean of the seven leadership functions.

Satisfaction indices. The satisfaction perceptions of soldiers are important in determining any perception predisposition. 1) *Job satisfaction* is the amount a soldier likes his/her job. The variable acts as a construct validity test of the overall leadership efficiency theory computed by the mean of the seven leadership functions. 2) *Supervisor satisfaction* is the amount a soldier likes his/her supervisor. The variable acts as a construct validity test of the overall leadership efficiency theory computed by the mean of the seven leadership functions. 3) *Leader satisfaction* is the amount a soldier likes his/her leader. The variable acts as a construct validity test of the overall leadership efficiency theory computed by the mean of the seven leadership functions. 4) *Unit satisfaction* is the amount a soldier likes his/her unit. The variable acts as a construct validity test of the overall leadership efficiency theory computed by the mean of the seven leadership functions. 5) *Army satisfaction* is the amount a soldier likes his/her Army. The variable acts as a construct validity test of the overall leadership efficiency theory computed by the mean of the seven leadership functions.

Type of unit. All units are categorized by the Department of the Army as combat, combat support, and combat service support in accordance with Army Field Manual 101-5-1 *Operational Terms and Graphics* (Department of the Army, 1997). Combat arms units are units who close with and destroy enemy forces or provide firepower and destructive capabilities on the battlefield. The included branches and functions are: Air Defense Artillery, Armor/Cavalry, Aviation, Field Artillery, Infantry, Special Forces, and the Corps of Engineers. Combat Arms units are considered the most tactical.

Combat support units are units that provide critical combat functions in conjunction with combat arms units and soldiers to secure victory. The included branches

and functions are: Chemical Corps, Civil Affairs, Psychological Operations, Military Intelligence, Military Police Corps, and the Signal Corps. Combat Support units are considered moderately tactical.

Combat service support units are units perform the essential capabilities, functions, activities, and tasks necessary to sustain all elements of operating forces in theater at all levels of war. Within the national and theater logistic systems, it includes but is not limited to that support rendered by service forces in ensuring the aspects of supply, maintenance, transportation, health services, and other services required by aviation and ground combat troops to permit those units to accomplish their missions in combat. Combat service support encompasses those activities at all levels of war that include those activities in stability and support operations that sustain all operating forces. The included branches and functions are: Adjutant General Corps, Acquisition Corps, Chaplain Corps, Finance Corps, Judge Advocate General Corps, Medical Corps, Ordnance Corps, Transportation Corps, and the Quartermaster Corps. Combat Service Support units are considered the least tactical.

Rank of Soldier. The soldier and leader's rank or grade represents technical level of expertise within their military occupational specialty. The higher the rank the greater the experience level within the military. Rank consists of private, private second class, private first class, specialist, corporal, sergeant, staff sergeant, sergeant first class, second lieutenant, and first lieutenant. Private through specialist are grouped as soldiers, corporal through sergeant first class are grouped as noncommissioned officers, and second lieutenant through first lieutenant are grouped as officers.

Situation. All units conduct Sergeant's Time Training (STT) weekly. Training is different among units; however, training execution and leadership guidance is structured in similar fashion among all units in the Army. All units are directed to follow training execution mandates followed under Field Manual 25-101 battle focused training (Department of the Army, 1990).

Survey Design and Questions

Questionnaire format was designed to group questions by function in a three-question measurement approach. The questionnaire is included in Appendix E. The first question within the leadership function was to identify the leader's functional level abilities or the perceived leadership abilities before training commences, measured from low to high. The second question within the leadership function was to identify the leader's functional level abilities or the perceived leadership abilities during the training. also measured from low to high. The third question was aimed at determining how much each leadership function was applied to the specific situation, specifically how much a leader is perceived to have or have not applied leadership talents and whether the leadership is applied too much, too little, or properly in each situation. The questions also took into account the "micro management" leadership phenomena, "too much", by assigning an inefficiency rating to this practice. General information was used to determine demographic patterns of leadership perceptions.

The research objectives were to investigate the significance of military leadership functions among units and soldiers, and to determine the overall composite macro-efficiency ratings as a function of soldier perceptions in the sergeant's time training

environment. The goal was to apply this research to the Army for broader macro-situational military leadership assessment and review.

After approval and permission from the committee, the University of Oklahoma's Internal Review Board, and United States Army to solicit survey information from units, units were contacted and scheduled for administration. Since the entire Army was unable to participate in the survey due to limited resources and time, the sample consisted of respondents from one Army theater command in Germany. Informal consent cover letters were obtained from respondents and individual unit commanders before administration of the sampling mechanism. The study was intended to assess respondents present at the training.

Responses were changed to more accurately assess abilities under the same circumstances. Similar wording was warranted to achieve similar conditions. Prior and during conditions were used to differentiate between item perspectives at different points in the training process.

In summary, the following steps were followed: 1) The survey and consent form format and design were based on the communication feedback model (Ledlow, 1999). This model suggests the proper placement of demographic items, possible item scales for targeted military populations, a military feedback orientation, a situational non-intrusive assessment format, and aids access into military populations with a University of Oklahoma IRB and a military approved approach to consent forms. 2) Questions were drafted by the researcher with the Major Professor. 3) Questions were compiled into instrument format and approved by the University of Oklahoma IRB and the Army. 4) The instrument was piloted on one unit containing 35 respondents. 5) The dissertation

committee reviewed the instrument, suggested revisions, and approved data collection. 6) The instrument was revised by the Major Professor and the researcher. 7) The final survey was administered in the field.

Data Analysis

Four sets of the independent variables were grouped according to prior, during, application, and satisfaction categories. This is to determine the impact of individual variables on the composite measures of each grouping. Factor analyses were run on the groups in Figure 5.

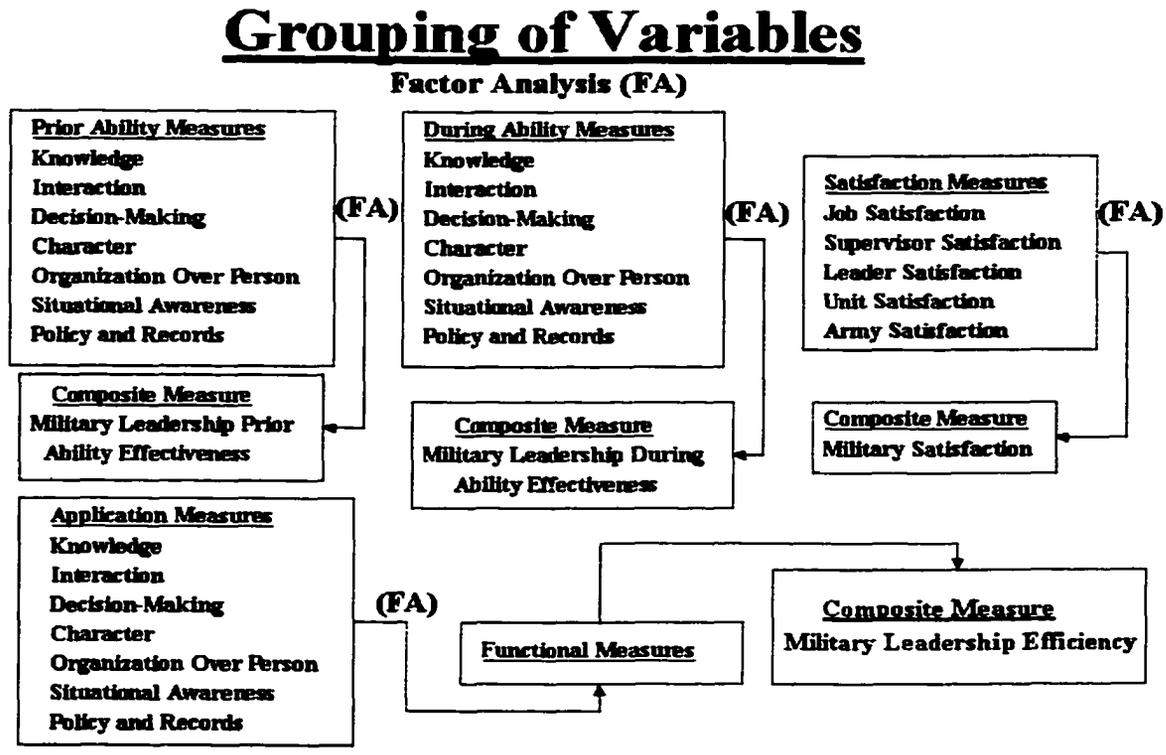


Figure 5. Factor Analyses of the Following Groups of Independent and Dependent Variables.

For hypothesis 1, see Figure 6, a flowchart depicts the relationship of the independent variables to the dependent variables and the analysis pathway. Figure 7 lists a series of analysis of variance models used to find the best overall model for leadership measure based on the seven functions. To achieve a power of .80, with a=.05, for a seven factor k=7, degrees of freedom u=6, the sample size required for a small effect and a medium effect size are n=300 and n=44 respectively. According to the power analysis in Ha3, the sample size implied a power of .98 in relation to a small effect size and a power >.995 for a medium effect size (Cohen, 1988).

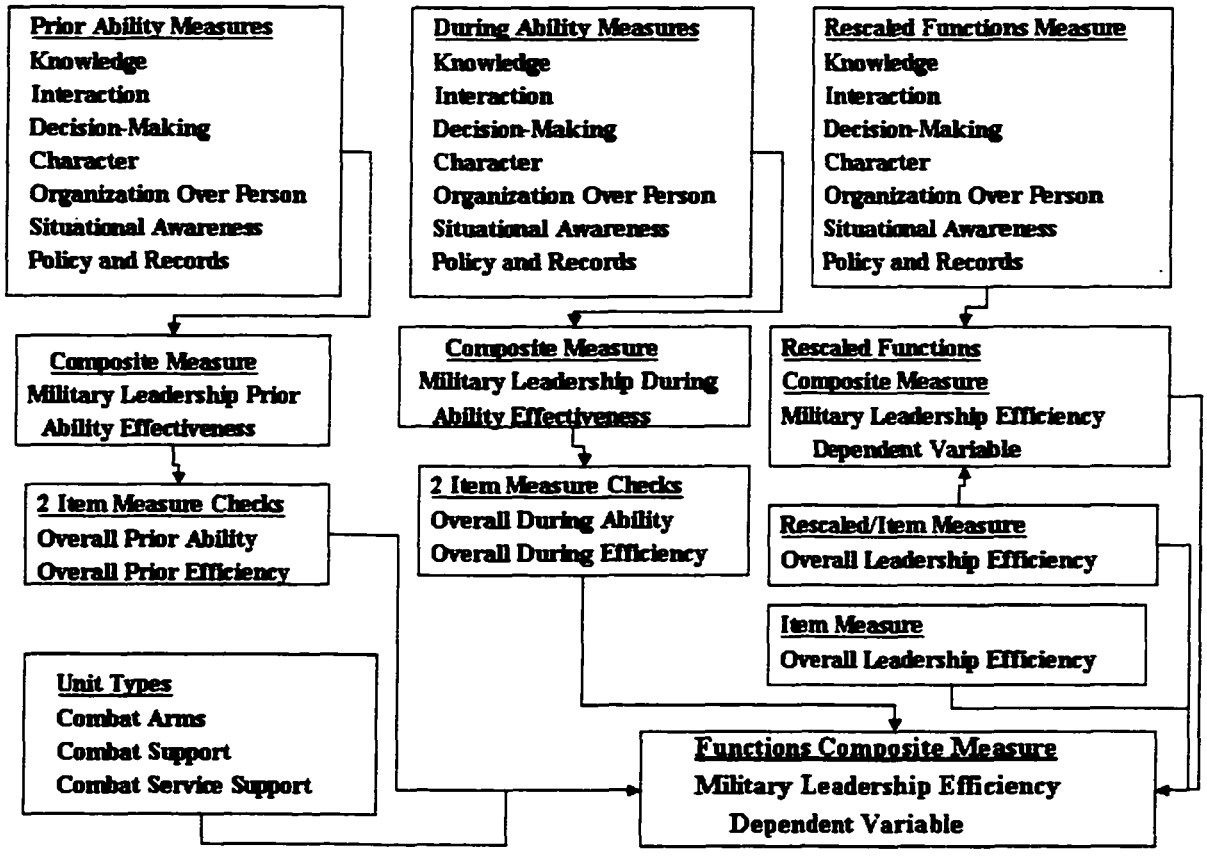


Figure 6. Research Design Concept: Flow chart of unit and leadership item relationships to the composite measures of the dependent variables in search of the best model to predict military leadership efficiency.

To find the best one variable model, an R^2 comparison was measured from the overall efficiency item, the overall prior ability item, the overall during ability item, the prior efficiency item, and the during efficiency item to best predict the composite leadership efficiency mean (y1) of the seven leadership application functions. This is needed to investigate the construct and face validity of the composite leadership efficiency mean (y1). The following research designs, see Figures 7 and 8, are listed to show the comparison of the effectiveness and efficiency scales.

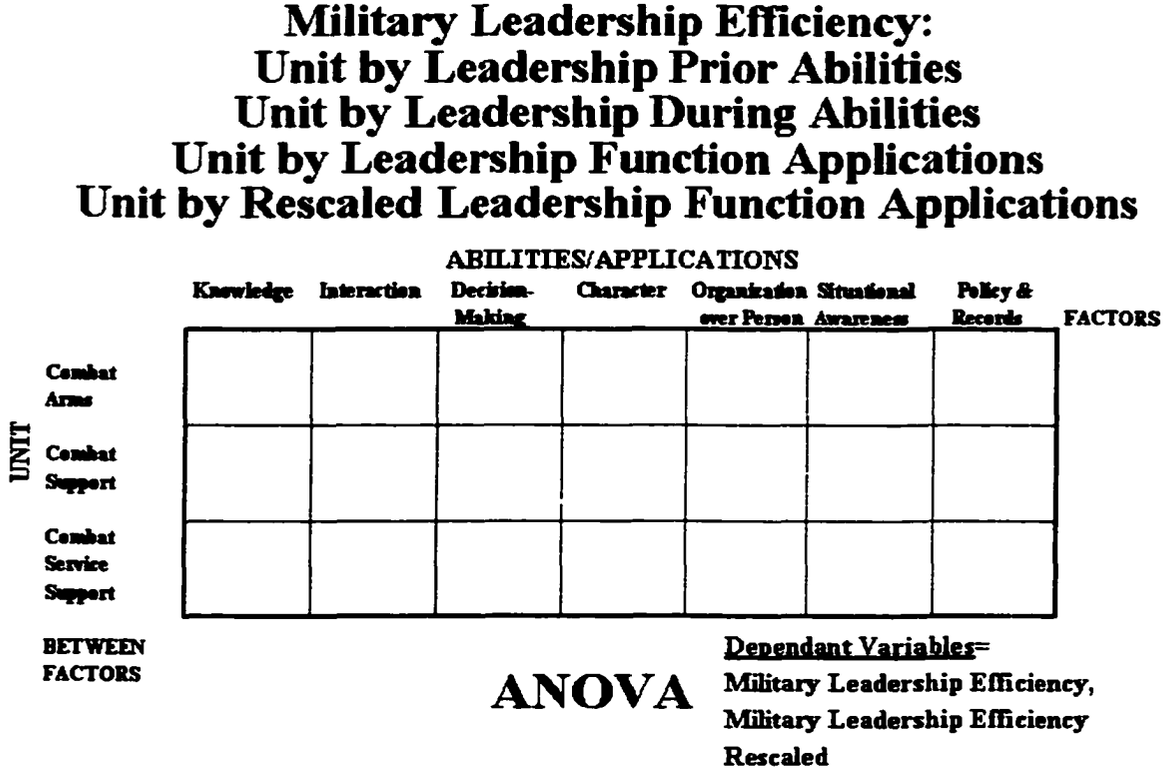


Figure 7. Leadership research design (prior abilities, during abilities, and function application) versus unit with regard to military leadership efficiency and the rescaled leadership efficiency measure.

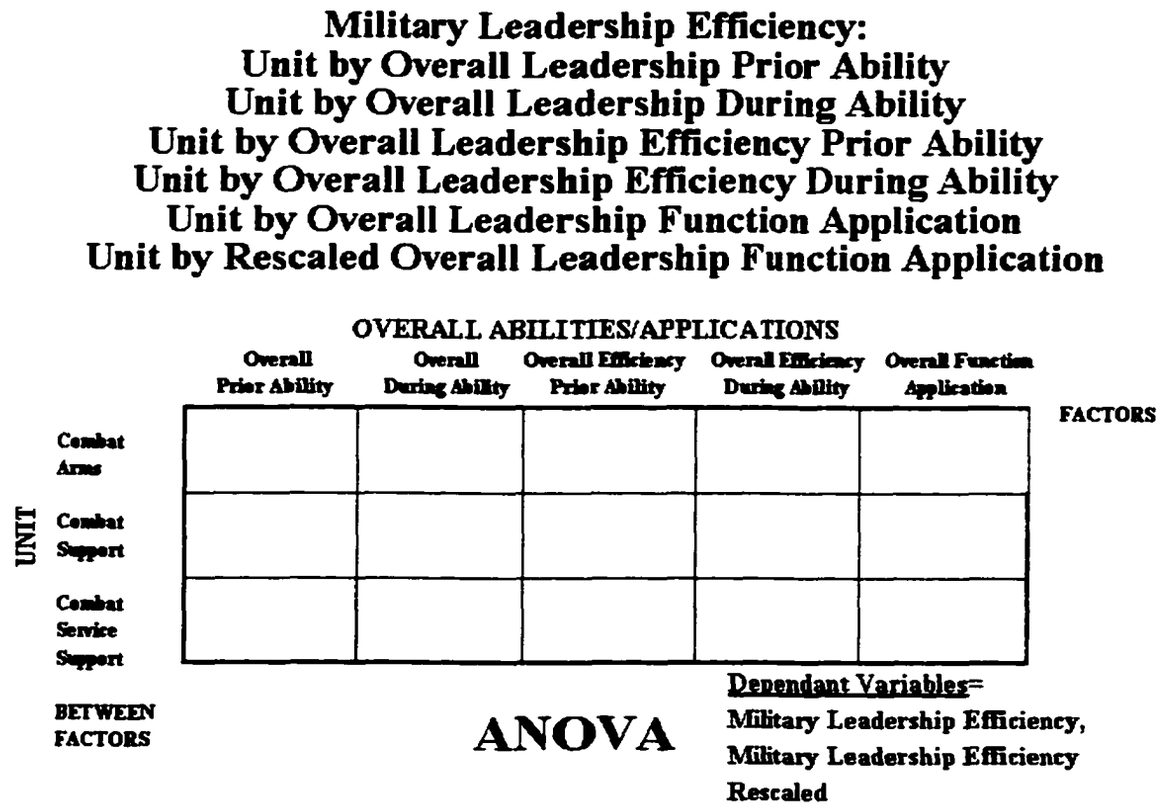


Figure 8. Leadership research design (overall; prior ability, during ability, efficiency prior ability, efficiency during ability, and function application) versus unit with regard to military leadership efficiency and the rescaled leadership efficiency measure.

For hypothesis 2, see Figure 9, a flowchart depicts the relationship of the independent variables to the dependent variables and the analysis pathway. Figure 10 on page 48 lists a series of analysis of variance tests were completed to determine the impact of military satisfaction among units with regard to military leadership efficiency. To achieve a power of .80, with a=.05, for a seven factor k=5, degrees of freedom u=4, the sample size required for a small effect and medium effect size is n=250 and n=39

respectively. According to the power analysis in Ha3, the sample size implied a power of .98 with a small effect size and a power >.995 for a medium effect size (Cohen, 1988).

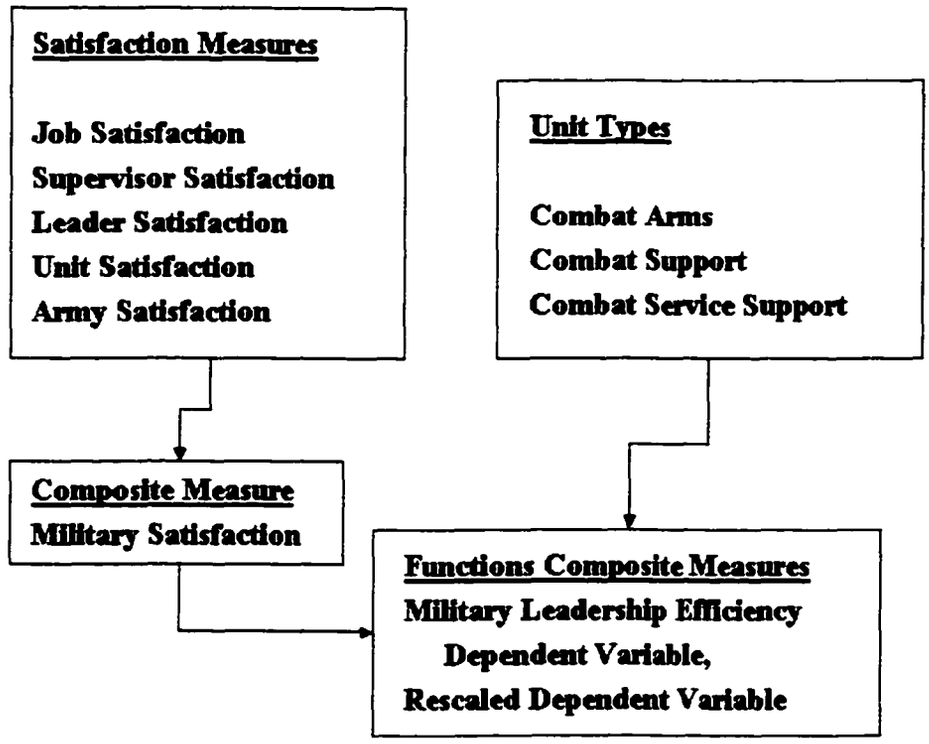


Figure 9. Research Design Concept: Flow chart of unit and satisfaction item relationships to the composite measures of the dependent variables in search of the best model to predict military leadership efficiency.

To find the best one satisfaction variable model, an R^2 comparison was measured from each satisfaction variable, the job satisfaction item, the supervisor satisfaction item, the leader satisfaction item, the unit satisfaction item, and the Army satisfaction item to best predict the composite leadership efficiency mean (y1) of the seven leadership

application functions. This is needed to investigate the construct validity of the composite leadership efficiency mean (y1).

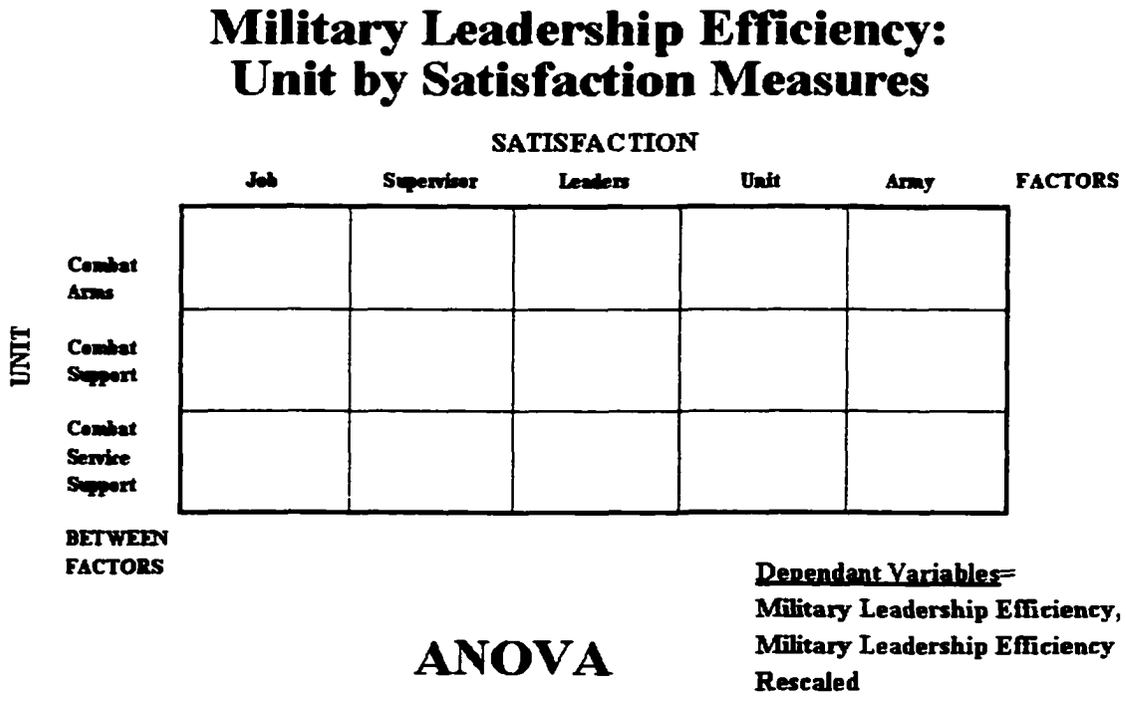


Figure 10. Leadership research design satisfaction versus unit with regard to military leadership efficiency and the rescaled leadership efficiency measure.

For hypothesis 3, Figure 11, a flowchart depicts the relationship of the independent variables to the dependent variables and the analysis pathway. Figure 12 on page 50 lists a series of analysis of variance tests were completed to determine the impact of military rank among units with regard to military leadership efficiency and the rescaled leadership efficiency measure.

To achieve a power of .80, with a=.05, for a two factor k=2, degrees of freedom u=1, the sample size required for a small effect and medium effect size is n=400 and n=64 respectively. The sample size implied a power of .95 for a small effect size and a power >.995 for a medium effect size (Cohen, 1988). A representative sample of a company consisted of an officer, and a mix of NCOs (1/3) and soldiers (2/3). According to the power analysis, a 30 member representative sample from each company met the sample size. Five companies from Combat Arms, Combat Support, and Combat Service Support units were represented. The total respondent goal equaled 450.

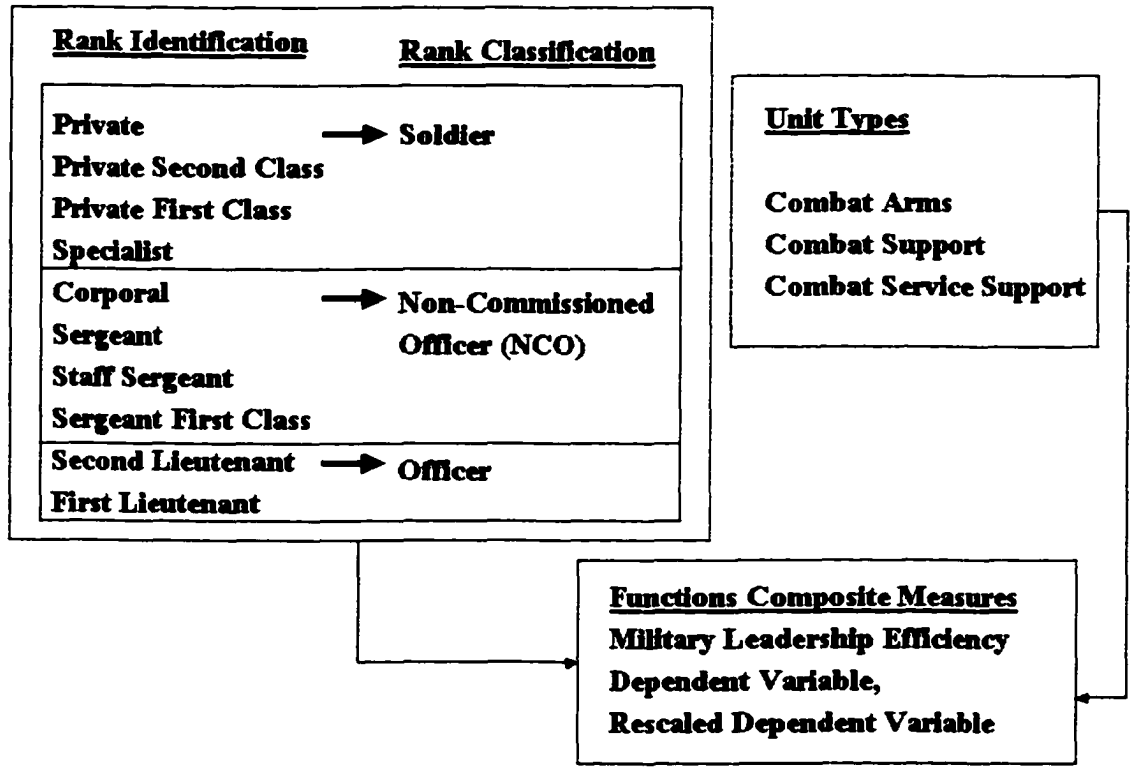


Figure 11. Research Design Concept: Flow chart of unit and rank item relationships to the composite measures of the dependent variables in search of the best model to predict military leadership efficiency.

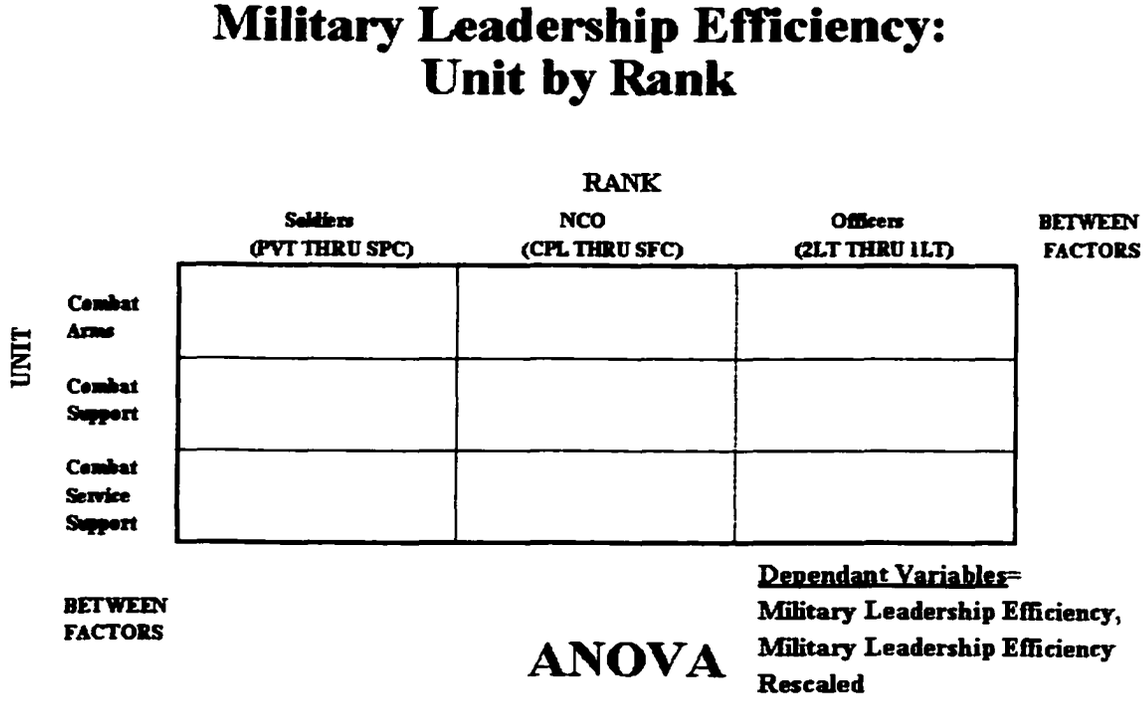


Figure 12. Leadership research design rank versus unit with regard to military leadership efficiency and the rescaled leadership efficiency measure.

CHAPTER 4

Results

Descriptive Statistics

The sample size was 554 respondents from 16 units. Pilot data were not combined with the regular data from the sample respondents. Table 3 reports demographic data.

Table 3. Combat Arms/ Combat Support/ Combat Service Support Unit Distribution.

Gender	**Frequency**	**Total**	**Race**	**Frequency**	**Total**	**Education**	**Frequency**	**Total**
Male	161/144/130	435	White	101/102/81	284	Attended High School/GED	10/6/17	33
Female	13/30/72	115	Black	32/37/75	144	Completed High School/GED	103/80/102	285
No Response	3/1/0	4	Native American	6/2/3	11	Attended Vocational College	7/13/11	31
Marital Status	**Frequency**	**Total**	Asian	4/1/9	14	Completed Vocational College	4/4/5	13
Married	74/79/83	236	Hispanic	25/23/17	65	Attended Undergraduate College	31/50/36	117
Single	102/93/119	314	Another Race Type	6/8/15	29	Completed Undergraduate College	9/14/16	39
No Response	1/3/0	4	No Response	3/2/2	7	Attended Graduate College	3/6/13	22
Rank Group	**Frequency**	**Total**				Completed Undergraduate College	7/1/2	10
Soldier	113/104/141	358				No Response	3/1/0	4
NCO	57/62/52	171						
Officer	5/7/7	19						
No Response	2/2/2	6						

Data were collected between 19 July 2001 and 18 October 2001. This included data obtained before and after the September 11, 2001 U.S. terrorism attacks on New York and Washington D.C. The data collection schedule is listed in Table 4.

Table 4.

Unit Data Collection Dates

Unit	Sample Amount	Date	Number of Units
Combat Service Support Units	51/44	19 July 2001	2
Combat Arms Unit	32	23 July 2001	1
Combat Service Support Unit*	28	26 July 2001	1
Combat Service Support Unit	34	2 August 2001	1
Combat Support Unit**/ Combat Arms Unit	15/51	9 August 2001	2
Combat Service Support Unit	45	16 August 2001	1
Combat Support Unit/ Combat Arms Unit*	37/25	23 August 2001	2
Combat Support Unit	32	30 August 2001	1
Combat Arms Unit	37	6 September 2001	1
Combat Arms Unit	32	13 September 2001	1
Combat Support Unit	30	20 September 2001	1
Combat Support Unit	31	27 September 2001	1
Combat Support Unit	30	4 October 2001	1

Note. * Units failed to meet the 30-member unit-sampling goal, however the units were included in the overall analysis. ** Unit failed to meet the 30-member unit-sampling goal and include members of all rank groups, however the unit was included in the overall analysis. Three combat support units were unable to participate due to the force protection missions after the September eleventh attacks.

Prior and during abilities of the same function had highly correlated values, which revealed low discriminant validity during the training event. Problems arose between each prior and during question with the similar wording item statements with only two

words to separate meaning between items. Validity coefficients ranged from .74 to .87. See Table 5 page 54, values are highlighted in bold.

This might justify the elimination of one or the other. For example, one might eliminate all during ability assessment items due to the high correlation between prior and during abilities. Composite and overall item questions on the effectiveness scale also had low discriminant validity for cumulative prior and during ability questions and composite means. There is no strong distinction between prior and during meanings for all leadership ability and composite ability items. Validity coefficients ranged from .74 to .92. See Table 6 page 55, values are highlighted in bold.

The applied scale and rescaled questions however, did show distinct discrimination from prior and during ability effectiveness questions. For example, the overall application item on the original scale, question 26 on the survey, had less than moderate correlations with regard to the overall prior and during ability questions. The overall efficiency application did correlate highly with the composite application means with both the original and rescaled models. This strongly supports the construct validity of the application items for both original and rescaled scales. For example, all respondents predicted the overall efficiency in line with the composite application mean of all functions for both the original scale of .70 and the rescaled model of .66. The need for the rescaling was further supported by the high discrimination between the original and rescaled application values. For example, both original and rescaled overall application efficiency items did not correlate well with the validity coefficient of .07 and .17, as well as the composite application coefficient of .21 and .10 with the rescaled item and rescaled composite applications. See Table 5 page 55, values are highlighted in bold.

Table 5.

Pearson's Correlation Coefficients for Prior, During, and Applied Functions: Validity Coefficients.

	Prior Knowledge Ability	During Knowledge Ability	Knowledge Applied	Prior Decision-Making Ability	During Decision-Making Ability	Decision-Making Applied	Prior Interaction Ability	During Interaction Ability	Interaction Applied	Prior Character Ability	During Character Ability	Character Applied	Prior Organization Ability	During Organization Ability	Organization Applied	Prior Situational-Awareness Ability	During Situational-Awareness Ability	Situational Awareness Applied	Prior Policy Ability	During Policy Ability
During Knowledge Ability	**.82**																			
Knowledge Applied	.38	.41																		
Prior Decision-Making Ability	.66	.65	.37																	
During Decision-Making Ability	.57	.69	.42	**.79**																
Decision-Making Applied	.38	.38	.55	.43	.42															
Prior Interaction Ability	.56	.54	.34	.63	.59	.37														
During Interaction Ability	.55	.63	.41	.61	.67	.42	**.81**													
Interaction Applied	.35	.34	.53	.38	.37	.57	.44	.45												
Prior Character Ability	.52	.56	.39	.57	.56	.36	.58	.60	.38											
During Character Ability	.51	.58	.41	.52	.58	.37	.57	.64	.41	**.87**										
Character Applied	.27	.27	.47	.25	.26	.47	.28	.29	.48	.30	.30									
Prior Organization Ability	.37	.32	.25	.38	.29	.19	.28	.26	.15	.28	.29	.23								
During Organization Ability	.37	.32	.23	.36	.32	.26	.27	.27	.18	.28	.32	.20	**.74**							
Organization Applied	.19	.24	.32	.18	.21	.31	.18	.19	.25	.27	.24	.37	.36	.35						
Prior Situational-Awareness Ability	.56	.55	.36	.58	.54	.35	.56	.57	.36	.60	.58	.32	.40	.37	.24					
During Situational-Awareness Ability	.57	.58	.40	.59	.59	.39	.56	.63	.41	.58	.61	.32	.38	.40	.25	**.84**				
Situational Awareness Applied	.34	.35	.44	.38	.38	.47	.31	.34	.47	.35	.37	.46	.22	.26	.42	.45	.48			
Prior Policy Ability	.58	.55	.32	.61	.54	.32	.56	.55	.37	.57	.56	.28	.38	.36	.20	.62	.64	.36		
During Policy Ability	.55	.60	.39	.57	.58	.34	.53	.62	.40	.58	.62	.29	.34	.36	.21	.61	.67	.40	**.86**	
Policy Applied	.35	.38	.54	.35	.37	.57	.34	.37	.53	.33	.39	.49	.24	.26	.36	.38	.45	.57	.43	.45

Table 6.

Pearson's Correlation Coefficients for Overall and Composite Prior, During, and Applied Functions: Validity Coefficients.

	Overall Prior Ability	Overall Prior Efficiency Ability	Composite All Prior Abilities	Overall During Ability	Overall During Efficiency Ability	Composite All During Abilities	Overall Applied Efficiency Original Scale	Composite Applied Original Scale	Overall Applied Efficiency Rescaled Scale
Overall Prior Efficiency Ability	**.77**								
Composite All Prior Abilities	**.81**	**.78**							
Overall During Ability	**.89**	**.76**	**.77**						
Overall During Efficiency Ability	**.75**	**.89**	**.74**	**.80**					
Composite All During Abilities	**.76**	**.76**	**.92**	**.81**	**.80**				
Overall Applied Efficiency Original Scale	.47	.45	.48	.51	.49	.53			
Composite Applied Original Scale	.48	.48	.56	.51	.51	.59	**.70**		
Overall Applied Efficiency Rescaled Scale	.29	.26	.26	.30	.28	.27	**.07**	**.10**	
Composite Applied Rescaled Scale	.30	.32	.31	.29	.34	.33	**.17**	**.21**	**.66**

Defining a response rate required specifying the denominator, that is the target sample size. Once respondents were recruited, the response rate was very high. The response rate was 99% of those contacted, able to (approved by the company commander) and asked to participate. One respondent refused to participate and one survey was thrown out due to an invalid respondent signature on the consent form. Only respondents who attended training and authorized by the company commander were included in the study. An item response rate was 98 %, with 437 missing items out of a possible 23,822 items. Questions were raised by individuals from each unit as to the anonymity of the survey, and in each case the researcher assured the participants of no risk. The researcher checked for completeness of the survey, and if incomplete asked the participant whether or not they wished to respond.

However, if the target sample is defined as all soldiers engaged in the training operation, the response rate was lower. In fact the researcher was unable to account for all eligible respondents. The researcher was only allowed access after the AARs. Potential respondents who were at training initially may have left. Accountability was not in the control of the researcher. Commanders and/or unit leaders may have excused respondents to fulfill other missions.

To clarify, the researcher's pre-conditions were: 1) Attempt to meet the 30 member-sampling goal for each unit set forth in the power analysis. 2) Unit respondents from each unit must be representative of each rank group officer, NCO, and enlisted. 3) Respondents had to have attended training.

Responses to unit type contained 36% error in perception, as 202 out of 554 respondents chose another unit type than the one to which they belonged. The researcher

adjusted for the response error by recording the actual unit type. Survey participants' ages ranged from 18 to 46 years with a mean of 24, median of 23, and mode of 20 years of age. Thirty-nine percent of the military respondents listed that they had children, while 37% indicated the number of children they had. Forty-nine different military occupation specialties (MOS) were represented. Fifty-four percent of the participants made a suggestion to improve the leadership within the unit. The survey completion time was approximately 10-20 minutes.

Hypothesis 1.

1. Reliability.

The reliability measure used was Cronbach's Coefficient Alpha. All prior- and during-training perception items attained relatively high reliability coefficients against the leadership efficiency scaled measure. The coefficient alphas for all prior-training abilities were .88 for raw variables and .88 for the standardized variables. The coefficient alphas for all during-training abilities were .88 for the raw variables and .89 for the standardized variables. See Appendix A for SAS runs.

All applied leadership items also attained high reliability coefficients. The coefficient alphas for all applied-leadership-to-training were .88 for raw variables and .89 for the standardized variables. All validity items realized high coefficient alphas. The standardized coefficient alphas for the overall prior-ability was .88, the overall during-ability was .87, the overall prior-ability efficiency was .88, the overall during-ability efficiency was .88, and the overall efficiency was .91.

All prior- and during-training perception items attained relatively high reliability coefficients against the leadership efficiency rescaled measure. The coefficient alphas for

all prior-training abilities were .87 for raw variables and .86 for the standardized variables. The coefficient alphas for all during-training abilities were .87 for the raw variables and .87 for the standardized variables. The coefficient alphas for all rescaled applied-leadership-to-training were .86 for raw variables and .88 for the standardized variables.

2. Factor Analysis.

The factor analyses of the leadership measures were broken down into 3 sets of factor analyses, prior abilities, during abilities, and applied leadership measures. Each set contained the seven leadership variables. A scree test was conducted, as described by Kim and Mueller (1978), to confirm factor extractions based upon eigenvalues. A measure of sample adequacy (MSA) was performed to ensure the adequacy of the data for the factor analyses (Kim & Mueller, 1978). See Appendix A for SAS runs.

Prior-ability leadership measures achieved cumulative eigenvalues of .59 for the first factor and .70 for the second. These two factors were retained and rotated by varimax. The first factor revealed the presence of prior-ability leadership measures, with factor pattern coefficients for prior knowledge of .57, prior decision-making of .65, prior interaction of .68, prior character of .64, prior situational awareness of .55, and prior policy of .57 had similar values. Prior organizational influence loaded .23, and offered a weak relationship with the first factor. The second factor had a strong relationship with prior situational awareness of .52, prior policy of .53, and similar positive relationships are with prior knowledge of .49, prior decision-making of .46, and prior organizational influence of .46, prior character of .35, and prior interaction of .34. Prior-abilities

achieved a sample adequacy MSA rating of .91. According to Kim and Mueller (1978), the prior ability sample adequacy is excellent or "marvelous".

During-ability leadership measures achieved cumulative eigenvalues of .60 for the first factor and .72 for the second, so that these two factors were retained and rotated by varimax. The first factor revealed the presence of during-ability leadership measures, with factor pattern coefficients for during-knowledge of .68, during-decision-making of .71, during-interaction of .70, during-character of .56, during-situational-awareness of .45, and during-policy of .53 had similar values. During organizational influence loaded .20, and offered a weak relationship with the first factor. The second factor had a strong relationship with during situational awareness of .57, during policy of .58, and similar positive relationships are with during knowledge of .41, during decision-making of .39, during organizational influence of .42, during character of .52, and during interaction of .41. During-abilities achieved a sample adequacy MSA rating of .91. According to Kim and Mueller (1978), the during ability sample adequacy is excellent or "marvelous".

Applied leadership measures achieved cumulative eigenvalues of .54 for the first factor and .66 for the second, these two factors were retained and rotated by varimax. The first factor revealed the presence of applied leadership measures, with factor pattern coefficients for applied-knowledge of .62, applied-decision-making of .66, applied-interaction of .66, applied-character of .47, applied-situational-awareness of .43, and applied-policy of .58 had similar values. Applied-organizational-influence loaded .22, and offered a weak relationship with the first factor. The second factor had a strong relationship with applied-situational-awareness of .57, and similar positive relationships are with applied-character of .47, applied-organizational-influence of .50, applied-policy

of .49, applied-knowledge of .35, applied-decision-making of .35, and applied-interaction of .32. Applications achieved a sample adequacy MSA rating of .89. According to Kim and Mueller (1978), the application sample adequacy is "meritorious".

3. Hypothesis Testing.

Hypothesis one stated that the presence of leadership efficiency was attributed to differences in leadership functions among three different types of units. There were significant differences in leadership items and units to varying degrees. Testing the prior- and during-leadership abilities between the three units, several mean differences and interactions were present. Three sets of the seven leadership variables and three types of units were tested against the grand mean or composite measure of the leadership application of each of the seven variables. See Appendix A for SAS runs.

Tables 5 through 16 on pages 54 through 72 provide summary statistics for hypothesis one, and Figures 13 through 21 on pages 62 through 76 reflect sample mean relationships. Figure 13 on page 62 depicts the overall mean comparisons of each prior- and during-abilities. This was done to compare overall prior- and during-ability mean relationships with the factor weights. Figure 14 on page 62 represents prior-ability means by unit. These prior-ability composite scores represent an increase in perceived prior-abilities from Combat Service Support Units to Combat Support Units, and from Combat Support Units to Combat Arms Units. It is important to note that not all of the prior-abilities increased; prior-organizational-influence decreased from Combat Support Units to Combat Arms Units. Figure 15 on page 63 represents during-ability means by unit. These during-ability composite scores represent an increase in perceived during-abilities from Combat Service Support Units to Combat Support Units, and from Combat Support

Units to Combat Arms Units. This suggests consistent ability perceptions among units. The prior-organization-ability means do however, drop from Combat Support Units to Combat Arms Units. See Figure 14.

Table 7. Simple Statistics for Prior Leadership Abilities.

Variable	*N*	*Mean*	*Std Dev*	*Coefficient Alphas*
Leadership Efficiency (y1)	**554**	**2.90**	**0.62**	**0.88**
Prior Knowledge (X1)	**554**	**3.50**	**1.07**	**0.87**
Prior Decision-Making (X3)	**554**	**3.26**	**1.08**	**0.86**
Prior Interaction (X5)	**552**	**3.30**	**1.10**	**0.87**
Prior Character (X7)	**551**	**3.42**	**1.10**	**0.87**
Prior Organization Over Person (X9)	**552**	**3.45**	**1.15**	**0.89**
Prior Situational Awareness (X11)	**549**	**3.32**	**1.07**	**0.86**
Prior Policy & Records (X13)	**551**	**3.31**	**1.04**	**0.86**

Table 8. Simple Statistics for During Leadership Abilities.

Variable	*N*	*Mean*	*Std Dev*	*Coefficient Alphas*
Leadership Efficiency (y1)	**554**	**2.90**	**0.62**	**0.89**
During Knowledge (X2)	**553**	**3.67**	**1.00**	**0.88**
During Decision-Making (X4)	**552**	**3.38**	**1.00**	**0.88**
During Interaction (X6)	**552**	**3.39**	**1.05**	**0.88**
During Character (X8)	**548**	**3.48**	**1.07**	**0.88**
During Organization Over Person (X10)	**549**	**3.30**	**1.20**	**0.91**
During Situational Awareness (X12)	**550**	**3.33**	**1.08**	**0.87**
During Policy & Records (X14)	**552**	**3.36**	**1.03**	**0.88**

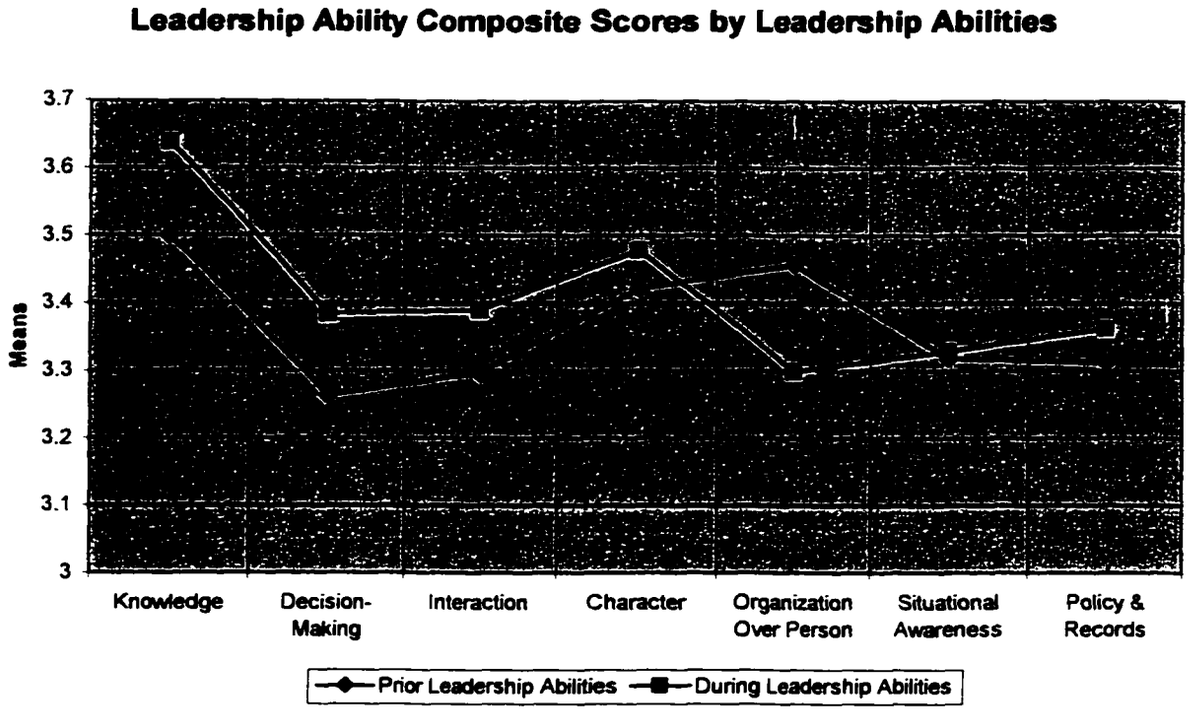


Figure 13. Leadership Ability Composite Scores by Leadership Abilities.

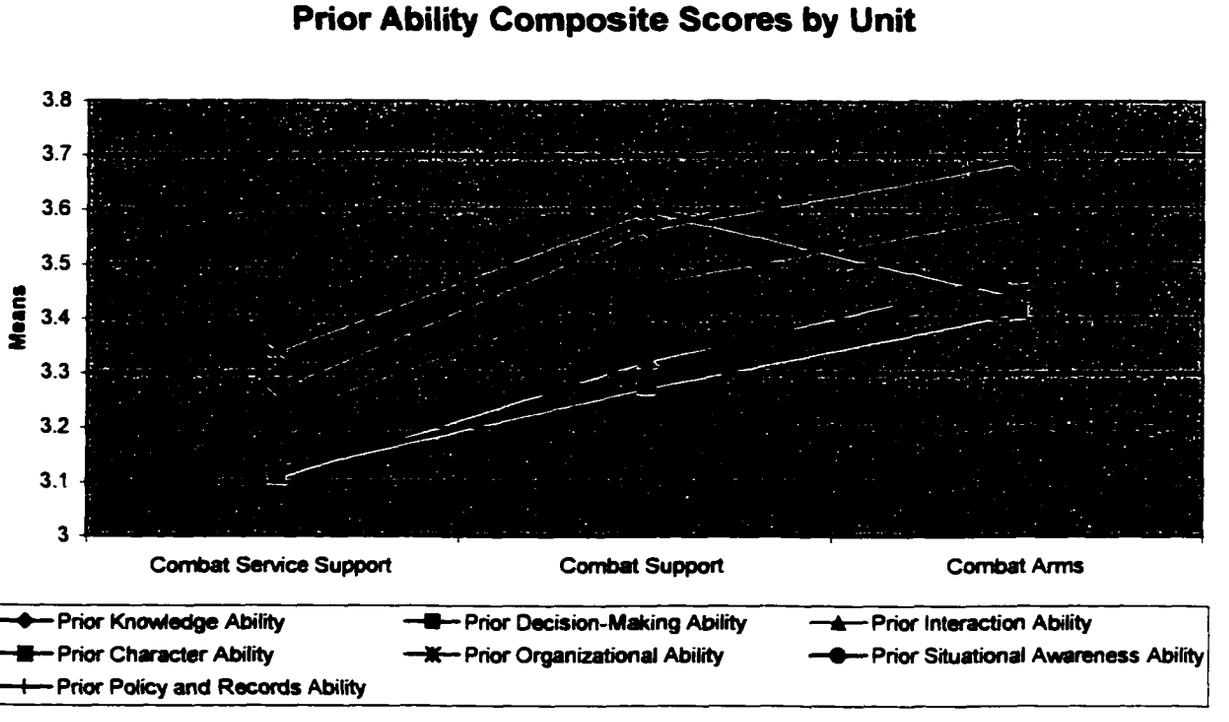


Figure 14. Prior Ability Composite Scores by Unit.

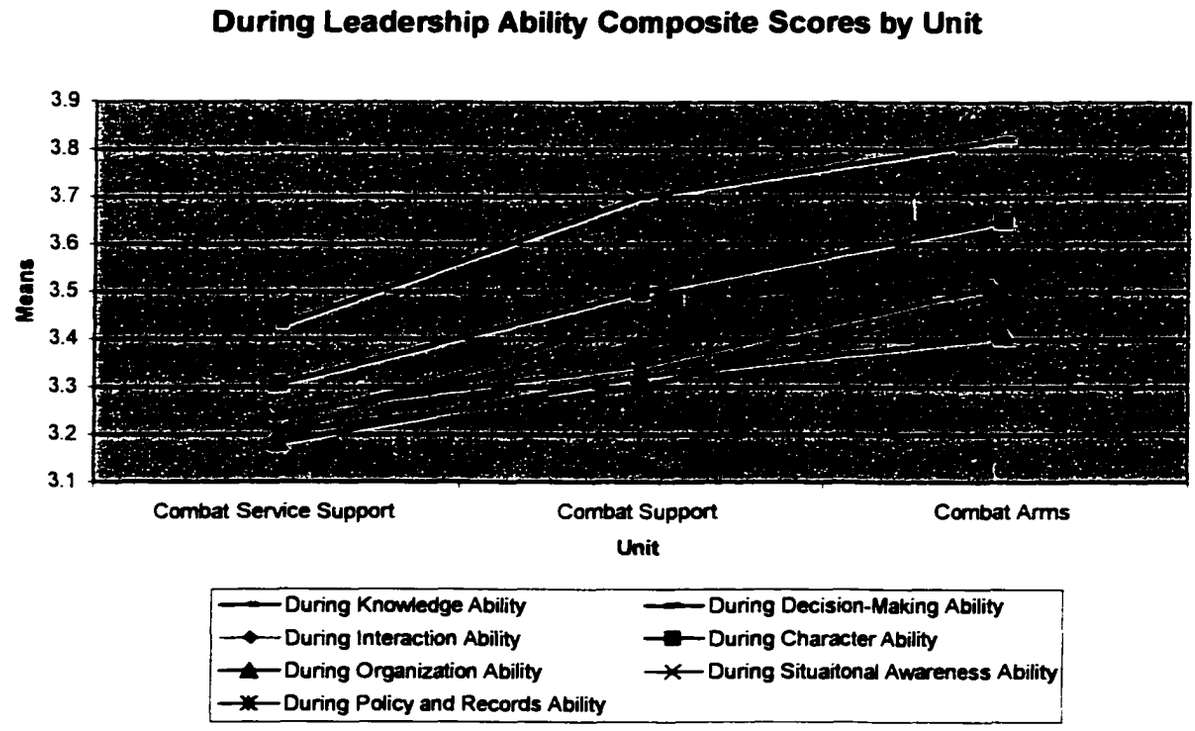


Figure 15. During Ability Composite Scores by Unit.

Analysis of variance summary findings are shown in Tables 11 and 12 on page 66 through 67. Model comparisons were completed to find the best model for each of the leadership functions and unit in Tables 9 and 10 on page 64 through 65. From the analysis of variance summary findings the following tables depict the best model statements in support of hypothesis one.

The original leadership efficiency application scale analysis was used to detect whether the expected value of the leadership efficiency application score was related to prior-knowledge, prior-decision-making, prior-interaction, prior-character, prior-organization, prior- situational-awareness, prior-policy abilities, during-knowledge, during-decision-making, during-interaction, during-character, during-organization, during-situational-awareness, and during-policy abilities.

SAS's "Guided Data Analysis" system suggested that respondents 435 and 428 made 3 and 5 outlier observations respectively, which violated an assumption of consistency among observations and prior-measures. Those observations were considered extreme and removed from the data by the researcher.

Table 9.

The Best Fitting Model Statements for each Prior Predictor Combined with Unit.

Best Fitting Prior Models
Leadership Efficiency = f(Unit, Prior-Knowledge Ability)
Leadership Efficiency = f(Unit, Prior-Decision-Making Ability)
Leadership Efficiency = f(Unit, Prior-Character Ability)
Leadership Efficiency = f(Unit, Prior-Organization Ability)
Leadership Efficiency = f(Unit, Prior-Situational-Awareness Ability)
Leadership Efficiency = f(Unit, Prior-Interaction Ability, Unit x Prior-Interaction Ability)
Leadership Efficiency = f(Unit, Prior-Policy Ability, Unit x Prior-Policy Ability)
Leadership Efficiency = f(Unit, Overall-Prior Ability, Unit x Overall-Prior Ability)
Leadership Efficiency = f(Unit, Overall-Prior-Efficiency Ability, Unit x Overall-Prior-Efficiency Ability)
Rescaled Leadership Efficiency = f(Unit, Prior-Knowledge Ability, Unit x Prior-Knowledge Ability)
Rescaled Leadership Efficiency = f(Unit, Prior-Decision-Making Ability, Unit x Prior-Decision-Making Ability)
Rescaled Leadership Efficiency = f(Unit, Prior-Character Ability, Unit x Prior-Character Ability)
Rescaled Leadership Efficiency = f(Unit, Prior-Organization Ability, Unit x Prior-Organization Ability)
Rescaled Leadership Efficiency = f(Unit, Prior-Situational-Awareness Ability, Unit x Prior-Situational-Awareness Ability)
Rescaled Leadership Efficiency = f(Unit, Prior-Interaction Ability, Unit x Prior-Interaction Ability)
Rescaled Leadership Efficiency = f(Unit, Prior-Policy Ability, Unit x Prior-Policy Ability)
Rescaled Leadership Efficiency = f(Unit, Overall-Prior Ability, Unit x Overall-Prior Ability)
Rescaled Leadership Efficiency = f(Unit, Overall-Prior-Efficiency Ability, Unit x Overall-Prior-Efficiency Ability)

SAS's "Guided Data Analysis" system suggested that respondent 428 made 7 outlier observations, which violated an assumption of consistency among observations and during-measures. Those observations were considered extreme and removed from the data by the researcher.

Table 10.

The Best Fitting Model Statements for each During Predictor Combined with Unit.

Best Fitting During Models
Leadership Efficiency = f(Unit, During-Knowledge Ability)
Leadership Efficiency = f(Unit, During-Decision-Making Ability)
Leadership Efficiency = f(Unit, During-Character Ability, Unit x During-Character Ability)
Leadership Efficiency = f(Unit, During-Organization Ability, Unit x During-Organization Ability)
Leadership Efficiency = f(Unit, During-Situational-Awareness Ability, Unit x During-Situational-Awareness Ability)
Leadership Efficiency = f(Unit, During-Interaction Ability, Unit x During-Interaction Ability)
Leadership Efficiency = f(Unit, During-Policy Ability, Unit x During-Policy Ability)
Leadership Efficiency = f(Unit, Overall-During Ability, Unit x Overall-During Ability)
Leadership Efficiency = f(Unit, Overall-During-Efficiency Ability, Unit x Overall-During-Efficiency Ability)
Rescaled Leadership Efficiency = f(Unit, During-Knowledge Ability, Unit x During-Knowledge Ability)
Rescaled Leadership Efficiency = f(Unit, During-Decision-Making Ability, Unit x During-Decision-Making Ability)
Rescaled Leadership Efficiency = f(Unit, During-Character Ability, Unit x During-Character Ability)
Rescaled Leadership Efficiency = f(Unit, During-Organization Ability, Unit x During-Organization Ability)
Rescaled Leadership Efficiency = f(Unit, During-Situational-Awareness Ability, Unit x During-Situational-Awareness Ability)
Rescaled Leadership Efficiency = f(Unit, During-Interaction Ability, Unit x During-Interaction Ability)
Rescaled Leadership Efficiency = f(Unit, During-Policy Ability, Unit x During-Policy Ability)
Rescaled Leadership Efficiency = f(Unit, Overall-During Ability, Unit x Overall-During Ability)
Rescaled Leadership Efficiency = f(Unit, Overall-During-Efficiency Ability, Unit x Overall-During-Efficiency Ability)

Table 11.

Analysis of Variance for Dependent Variable of Leadership Efficiency by Unit & Prior Abilities (Between Subjects)

Source	Df	F	F
		Leadership Efficiency (y1)	Rescaled Leadership Efficiency (y2)
Unit Actual (X43)	2	6.10**	8.06**
Prior Knowledge Ability (X1)	1	131.10**	30.83**
Unit x Prior Knowledge Ability	2	2.55	8.23**
B within group error	549/547	(.55)	(.45)
Unit Actual (X43)	2	4.64*	9.38**
Prior Decision-Making Ability (X3)	1	135.93**	41.21**
Unit x Prior DM Ability	2	2.08	9.84**
B within group error	550/548	(.55)	(.45)
Unit Actual (X43)	2	2.13	6.26**
Prior Interaction Ability (X5)	1	123.80**	32.86**
Unit x Prior Interaction Ability	2	3.38*	6.49**
B within group error	546	(.56)	(.46)
Unit Actual (X43)	2	5.21**	5.06**
Prior Character Ability (X7)	1	148.53**	44.89**
Unit x Prior Character Ability	2	2.50	5.33**
B within group error	547/545	(.55)	(.45)
Unit Actual (X43)	2	8.37**	3.86*
Prior Organization Ability (X9)	1	72.46**	7.89**
Unit x Prior Organization Ability	2	2.01	3.26*
B within group error	547/545	(.58)	(.47)
Unit Actual (X43)	2	4.91**	7.86**
Prior Situational Awareness Ability (X11)	1	158.40**	34.43**
Unit x Prior SA Ability	2	1.92	7.71**
B within group error	543/541	(.54)	(.45)
Unit Actual (X43)	2	2.02	7.73**
Prior Policy Ability (X13)	1	136.79**	26.49**
Unit x Prior Policy Ability	2	4.52*	7.61**
B within group error	544	(.55)	(.46)
Unit Actual (X43)	2	2.98	10.51**
Overall Prior Ability (X15)	1	156.12**	46.22**
Unit x Overall Prior Ability	2	4.59*	10.55**
B within group error	541	(.53)	(.44)
Unit Actual (X43)	2	7.58**	6.72**
Prior Overall Efficiency Ability (X17)	1	163.73**	52.08**
Unit x Prior OE Ability	2	2.40	6.13**
B within group error	544/542	(.53)	(.44)

Note. Values enclosed in parentheses represent mean square errors. Cells are nonorthogonal and values follow the Type III sum of squares. Analysis followed the Appelbaum and Cramer (1974) algorithm with the O'Brien Adaptation (Appelbaum & Cramer, 1974). *p < .05. **p <.01. See Appendix A for SAS runs.

Table 12.

Analysis of Variance for Dependent Variable of Leadership Efficiency by Unit & During Abilities (Between Subjects)

Source	Df	F	F
		Leadership Efficiency (y1)	Rescaled Leadership Efficiency (y2)
Unit Actual (X43)	2	5.62**	9.45**
During Knowledge Ability (X2)	1	146.09**	31.95**
Unit x During Knowledge Ability	2	1.12	9.87**
B within group error	549/547	(.55)	(.46)
Unit Actual (X43)	2	5.14**	8.71**
During Decision-Making Ability (X4)	1	155.01**	38.87**
Unit x During DM Ability	2	2.00	8.91**
B within group error	547/545	(.54)	(.45)
Unit Actual (X43)	2	3.97*	6.99**
During Interaction Ability (X6)	1	163.39**	39.98**
Unit x During Interaction Ability	2	5.29**	6.94**
B within group error	545	(.54)	(.45)
Unit Actual (X43)	2	2.59	5.93**
During Character Ability (X8)	1	161.12**	42.33**
Unit x During Character Ability	2	4.57**	6.01**
B within group error	541	(.53)	(.45)
Unit Actual (X43)	2	1.68	4.09*
During Organization Ability (X10)	1	76.62**	13.17**
Unit x During Organization Ability	2	4.18*	3.97*
B within group error	543	(.58)	(.47)
Unit Actual (X43)	2	2.32	6.09**
During Situational Awareness Ability X12)	1	194.43**	40.51**
Unit x During SA Ability	2	3.93*	6.52**
B within group error	543	(.53)	(.45)
Unit Actual (X43)	2	3.44*	6.96**
During Policy Ability (X14)	1	168.03**	38.36**
Unit x During Policy Ability	2	6.51**	7.11**
B within group error	545	(.54)	(.45)
Unit Actual (X43)	2	5.59**	9.60**
Overall During Ability (X16)	1	182.83**	47.17**
Unit x Overall During Ability	2	7.24**	9.64**
B within group error	540	(.52)	(.44)
Unit Actual (X43)	2	3.55*	6.71**
During Overall Efficiency Ability (X18)	1	193.73**	64.80**
Unit x During OE Ability	2	5.80**	6.60**
B within group error	541	(.52)	(.44)

Note. Values enclosed in parentheses represent mean square errors. Cells are nonorthogonal and values follow the Type III sum of squares. Analysis followed the Appelbaum and Cramer (1974) algorithm with the O'Brien Adaptation (Appelbaum & Cramer, 1974). *p < .05. **p <.01. See Appendix A for SAS runs.

The observed variation in leadership efficiency application score is attributable to 20.9% of the variation among predictions based on the value of prior-knowledge, 21.3% for prior-decision-making, 20.9% for prior-interaction, 22.8% for prior-character, 13.6% for prior-organization, 24.3% for prior-situational-awareness, and 22.5% for prior-policy ability. The p-values for these proportions are less than 1%. This constitutes strong statistical evidence that the expected value of the leadership efficiency application score is related to the value of all prior abilities.

The dependent variable, leadership efficiency, was rescaled to determine the degree of leadership inefficiency from the proper amount. SAS's "Guided Data Analysis" system suggested a power transformation of the rescaled dependent variable of 2.8, however the f-values retained their significance. Therefore, no transformation was done. The observed variation in rescaled leadership efficiency application score was attributable to 9.2% of the variation among predictions based on the value of prior-knowledge, 10.8% for prior-decision-making, 8.4% for prior-interaction, 10.4% for prior-character, 3% for prior-organization, 9.5% for prior-situational-awareness, and 8.1% for prior-policy ability. The p-values for these proportions are less than 1%. This constitutes strong statistical evidence that the expected value of the rescaled leadership efficiency application score is related to the value of all prior abilities.

The observed variation in leadership efficiency application score is attributable to 22.5% of the variation among predictions based on the value of during-knowledge, 23.7% for during-decision-making, 25.8% for during-interaction, 26.3% for during-character, 15% for during-organization, 29.2% for during-situational-awareness, and 26.2% for during-policy ability. The p-values for these proportions are less than 1%. This

constitutes strong statistical evidence that the expected value of the leadership efficiency application score is related to the value of all during abilities.

The observed variation in rescaled leadership efficiency application score was attributable to 9.5% of the variation among predictions based on the value of during-knowledge, 10.4% for during-decision-making, 9.2% for during-interaction, 10.3% for during-character, 4.3% for during-organization, 9.7% for during-situational-awareness, and 10.1% for during-policy ability. The p-values for these proportions are less than 1%. This constitutes strong statistical evidence that the expected value of the rescaled leadership efficiency application score is related to the value of all during abilities. However, the proportions of variance for the rescaled power transformation were consistently less than for the original rescaled dependent variable.

Leadership application items and validity items attained relatively high coefficients, see Tables 13 and 14. Overall means for each function remained below three indicating an overall less than proper amount of leadership function applied. However, Figure 16 illustrates the Combat Arms Units perceived leaders as overcompensating in leadership knowledge, interaction, situational awareness, and organization functions.

Table 13. Simple Statistics for Leadership Efficiency Application.

Variable	*N*	*Mean*	*Std Dev*	*Coefficient Alphas*
Leadership Efficiency (y1)	**554**	**2.90**	**0.62**	**0.86**
Knowledge Applied (X19)	**554**	**2.94**	**0.78**	**0.89**
Decision-Making Applied (X20)	**554**	**2.84**	**0.82**	**0.89**
Interaction Applied (X21)	**553**	**2.91**	**0.80**	**0.89**
Character Applied (X22)	**551**	**2.96**	**0.85**	**0.89**
Organization Over Person Applied (X23)	**548**	**2.87**	**1.13**	**0.90**
Situational Awareness Applied (X24)	**553**	**2.91**	**0.82**	**0.89**
Policy & Records Applied (X25)	**553**	**2.86**	**0.83**	**0.88**

Table 14. Simple Statistics for Leadership Validity Items and Scaled Measures.

Variable	*N*	*Mean*	*Std Dev*	Coefficient Alphas
Leadership Efficiency (y1)	**554**	**2.90**	**0.62**	**0.91**
Overall Prior Ability (X15)	**548**	**3.56**	**1.05**	**0.88**
Overall During Ability (X16)	**547**	**3.61**	**1.04**	**0.88**
Overall Prior Efficiency Ability (X17)	**550**	**3.37**	**1.09**	**0.89**
Overall During Efficiency Ability (X18)	**548**	**3.42**	**1.10**	**0.88**
Overall Leadership Efficiency Applied (X26)	**554**	**2.96**	**0.83**	**0.91**

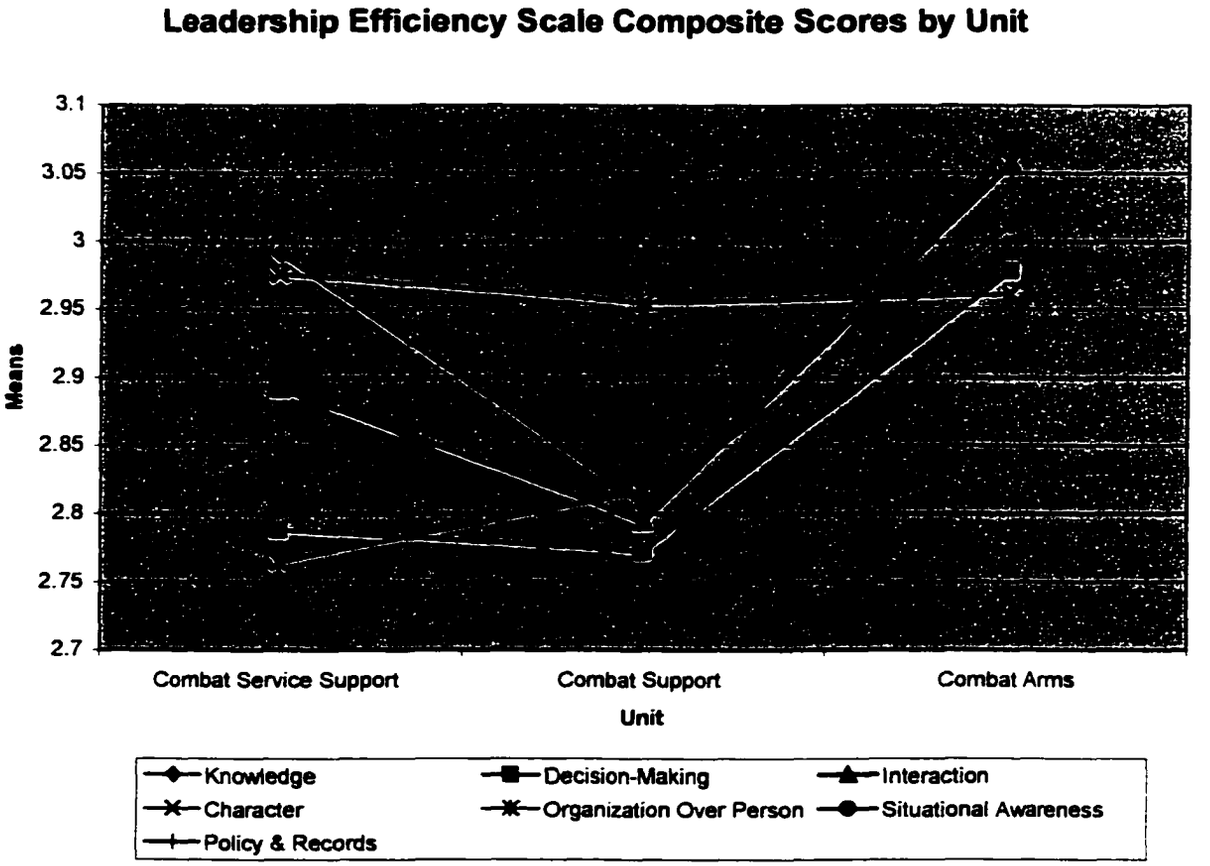


Figure 16. Leadership Efficiency Application Composite Scores by Unit.

Overall ability means in Figure 17 depict similar trends of increased measure from Combat Service Support Units to Combat Support Units, and Combat Support Units to Combat Arms Units, as prior- and during-ability Figures 14 & 15 on pages 62 and 63.

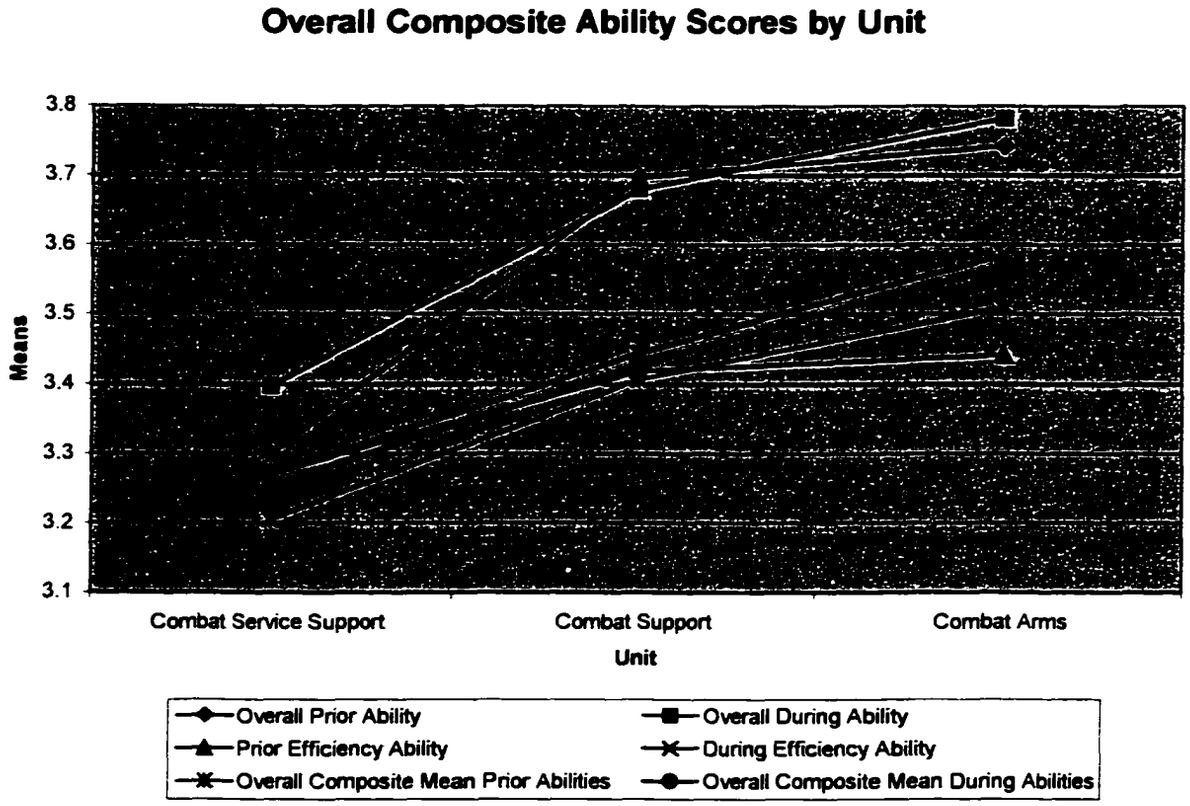


Figure 17. Overall Composite Ability Scores by Unit.

The rescaled statistics in Tables 15 and 16 reflect the means, standard deviations, and coefficients of each leadership application function and the overall efficiency item. Coefficients retained their high reliability values.

Table 15. Simple Statistics for Leadership Efficiency Application Rescaled Measures.

Variable	*N*	*Mean*	*Std Dev*	*Coefficient Alphas*
Leadership Efficiency (y2)	**554**	**2.47**	**0.48**	**0.83**
Knowledge Applied (~X19)	**554**	**2.57**	**0.65**	**0.87**
Decision-Making Applied (~X20)	**554**	**2.49**	**0.67**	**0.86**
Interaction Applied (~X21)	**553**	**2.52**	**0.64**	**0.87**
Character Applied (~X22)	**551**	**2.49**	**0.68**	**0.86**
Organization Over Person Applied (~X23)	**548**	**2.20**	**0.80**	**0.89**
Situational Awareness Applied (~X24)	**553**	**2.52**	**0.67**	**0.87**
Policy & Records Applied (~X25)	**553**	**2.50**	**0.67**	**0.87**

Table 16. Simple Statistics for Leadership Validity Items and Rescaled Measures.

Variable	*N*	*Mean*	*Std Dev*	*Coefficient Alphas*
Rescaled Leadership Efficiency (y2)	**554**	**2.47**	**0.48**	**0.88**
Overall Leadership Efficiency Applied Rescaled (~X26)	**554**	**2.51**	**0.67**	**0.89**
Leadership Efficiency (y1)	**554**	**2.90**	**0.62**	**0.91**
Overall Leadership Efficiency Applied (X26)	**554**	**2.96**	**0.83**	**0.91**

The rescaled means of each function "leveled out" as opposed to Figure 16 on page 70, see Figure 18. It is important to note, that for every type of unit, the perceived organization function attained a greater degree of leadership inefficiency. The increase in inefficient organizational influence means were surprisingly opposite from both prior- and during-ability graphs, from Combat Service Support Units to Combat Support Units, and from Combat Support Units to Combat Arms Units. Figures 14 and 15 on pages 62 and 63, represent an increase in both prior- and during-ability of the organization to influence the training from Combat Service Support Units to Combat Support Units, and from Combat Support Units to Combat Arms Units.

The intention for the overall efficiency item on the survey was to access the overall face and construct validity of the study. Table 16 reflects the high coefficient of the measure. Model comparisons were completed to find the best model for the overall efficiency items (both original and rescaled) and unit, see Table 17.

Table 17.

The Best Fitting Model Statements for each Predictor Combined with Unit.

Best Fitting Leadership Efficiency Models
Leadership Efficiency = f(Unit, Overall Efficiency, Unit x Overall Efficiency)
Rescaled Leadership Efficiency = f(Rescaled Overall Efficiency)

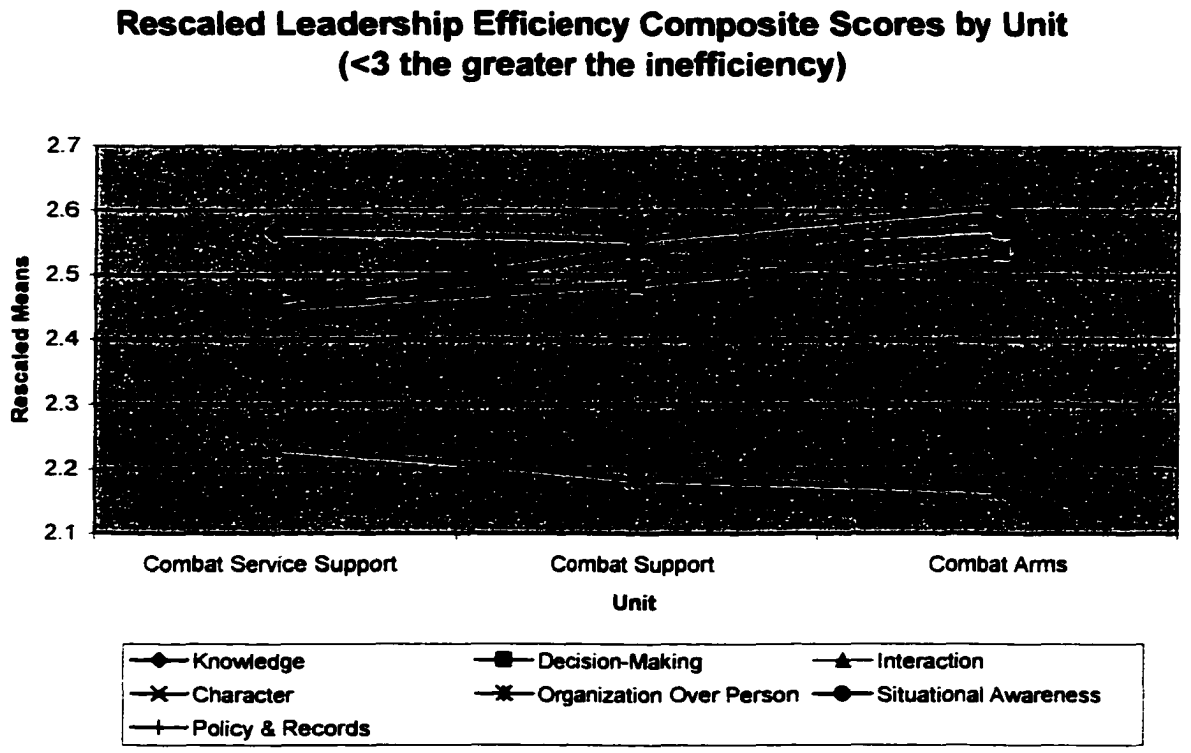


Figure 18. Rescaled Leadership Efficiency Composite Scores by Unit.

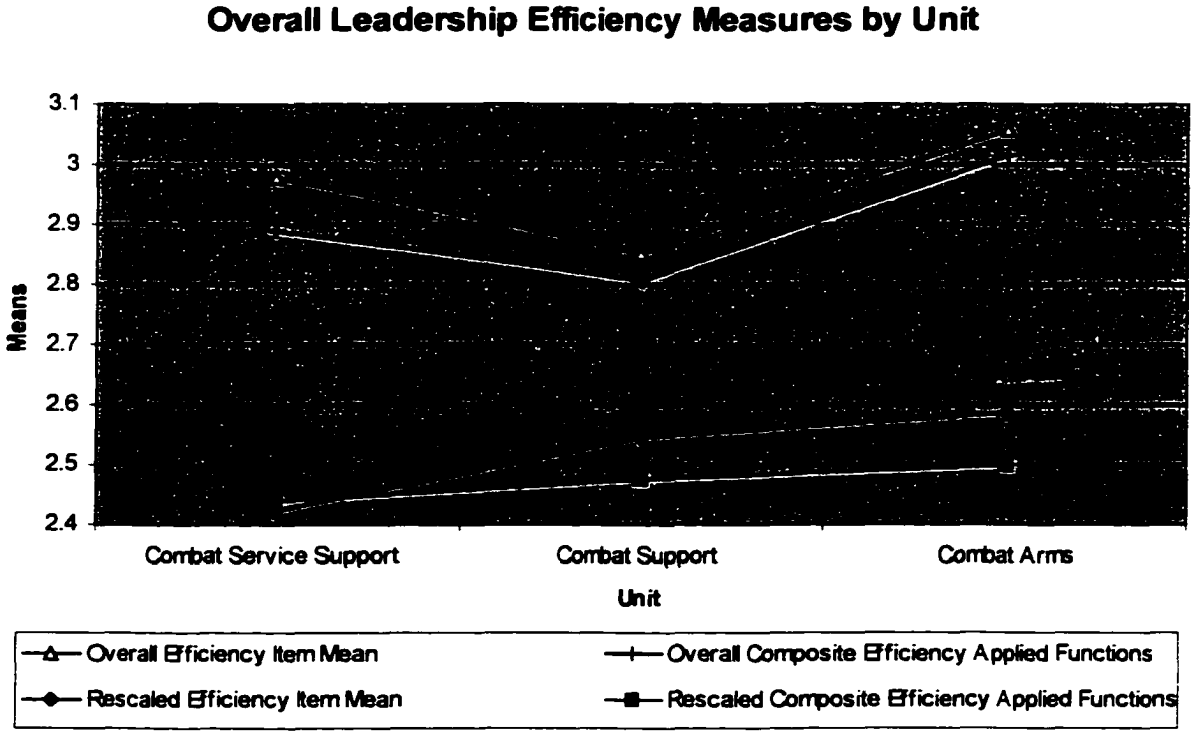


Figure 19. Leadership Efficiency Measures by Unit.

Figure 19 illustrates the need for rescaling, Combat Service Support Units' rescaled item mean was less than its rescaled composite score of all applied functions. The rescaled item mean reflects a greater inefficiency perceived than the composite mean of all applied functions in Combat Service Support Units.

Table 18.

Analysis of Variance for Leadership Efficiency by Unit & Overall Efficiency (Between Subjects)

Source	Df	F	
		Leadership Efficiency (y1)	Rescaled Leadership Efficiency (y2)
Unit Actual (X43)	2	2.77	.16
Overall Efficiency Measure (X26)/(~26)	1	487.32**	423.21**
Unit x Overall Efficiency Measure	2	4.50*	1.27
B within group error	548/550	(.44)	(.36)

Note. Values enclosed in parentheses represent mean square errors. Cells are nonorthogonal and values follow the Type III sum of squares. Analysis followed the Appelbaum and Cramer (1974) algorithm with the O'Brien Adaptation (Appelbaum & Cramer, 1974). *p < .05. **p <.01. See Appendix A for SAS runs.

The best one-variable model was the overall leadership efficiency variable (question 26 on the survey), with both dependent variables. R squared for the overall leadership variable was .43, that is 43% of the variance of overall leadership efficiency independent variable can be accounted for in representing the leadership efficiency composite application measure.

The full model for the dependent variable was significant when measuring the overall leadership efficiency independent variable and the unit ($F=108.57$; $p<.01$). This supports concurrent validity of the leadership efficiency dependent variable, by indicating

that group differences in over- and under- leadership applications to each unit's leadership efficiency were significant. The distribution of all leadership efficiency application scores support the face and construct validity of the measure, see Figure 20.

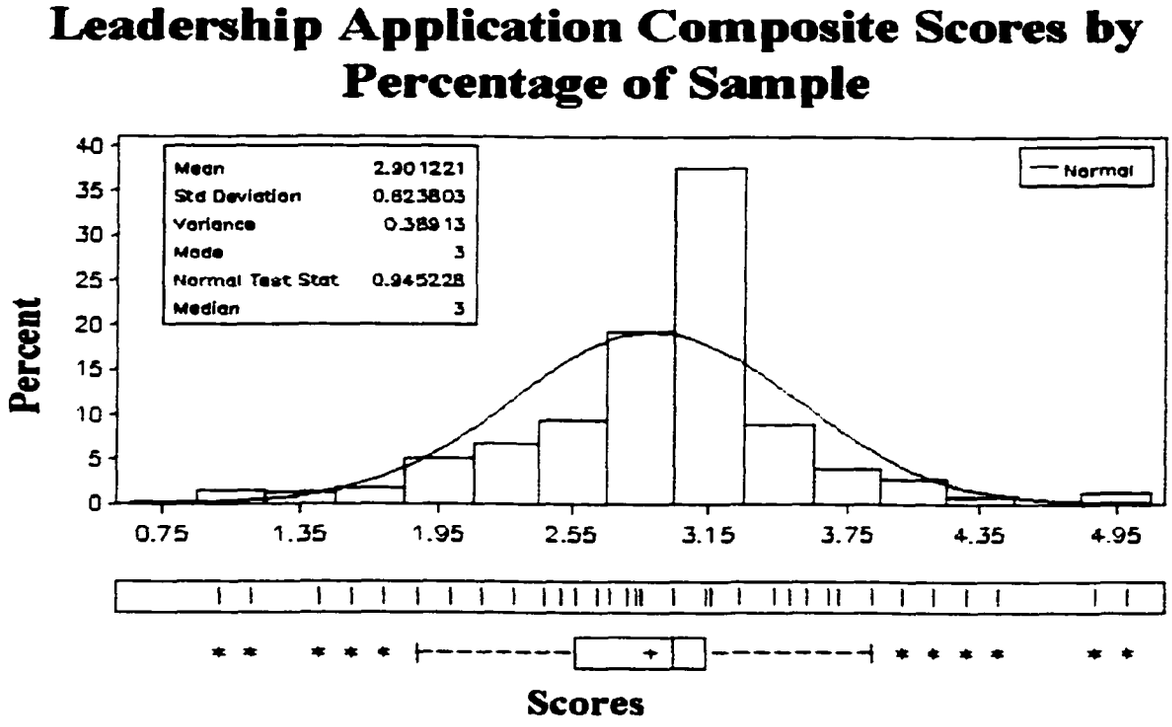


Figure 20. Leadership efficiency application Composite Scores by Percentage of Sample.

The one main effect model for the rescaled dependent variable was significant when measuring the rescaled overall leadership efficiency independent variable ($F=423.21$; $p<.01$). This supports concurrent, face, and construct validity of the leadership efficiency dependent variable, by indicating differences in inefficient and efficient leadership applications to the overall leadership efficiency item, which were significant. See Figure 21.

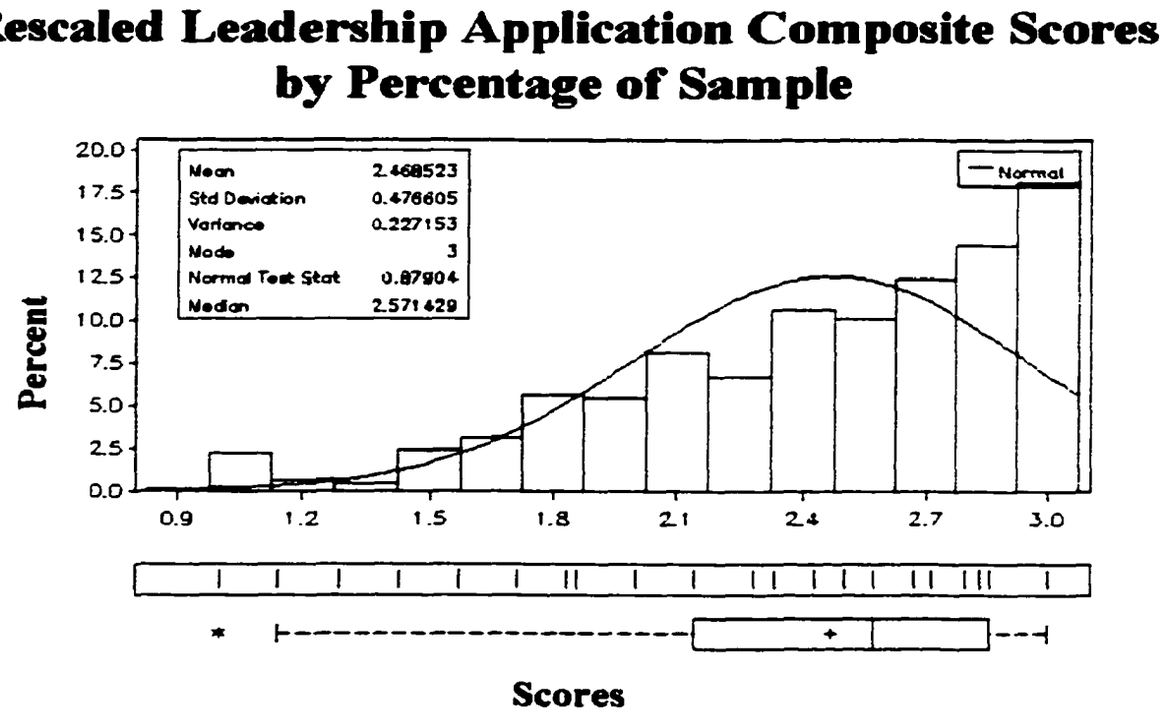


Figure 21. Rescaled Leadership efficiency application Composite Scores by Percentage of Sample.

Hypothesis one states that differences in military leadership efficiency among units can be attributed to knowledge, decision-making, interpersonal interaction, character, organization over person, policies and records, and situational awareness. Expected values of all functions among units are significantly related to the leadership efficiency dependent variable. Rejection of the null hypothesis is warranted.

Hypothesis 2.

1. Reliability.

The reliability measure used was Cronbach's Coefficient Alpha. All satisfaction perception items attained reliability coefficients against the leadership efficiency scaled

measure. The coefficient alphas for all satisfaction measures were .79 for raw variables and .79 for the standardized variables. The coefficient alphas for separate satisfaction measures attained weaker reliability coefficients in the presence of the other satisfaction measures, job satisfaction of .76, supervisor of .77, leaders in the unit satisfaction of .74, unit satisfaction of .74, and Army satisfaction of .78. See Appendix B for SAS runs.

All satisfaction perception items attained more moderate reliability coefficients against the leadership efficiency rescaled measure. The coefficient alphas for all satisfaction measures were .77 for raw variables and .75 for the standardized variables. The coefficient alphas for separate satisfaction measures attained more moderate reliability standardized coefficients in the presence of the other satisfaction measures, job satisfaction of .70, supervisor of.72, leaders in the unit satisfaction of .68, unit satisfaction of .68, and Army satisfaction of .72.

2. Factor Analysis.

The factor analysis of the satisfaction measures achieved cumulative eigenvalues of 1.05, and 1.18 respectively. Thus, two factors were retained and rotated by varimax. The first factor revealed the presence of all satisfaction measures, leader had a coefficient of .73, unit satisfaction of .63, and supervisor satisfaction of .52 had heavily weighted values. Army of .25 and job satisfaction of .34 had weaker coefficients. The second factor showed strong coefficients with job satisfaction of .63, Army satisfaction of .62, and unit satisfaction of .40. Leader satisfaction of .26 and supervisor satisfaction of .29 showed weaker weightings in the second factor. A scree test was conducted, as described by Kim and Mueller (1978), to confirm factor extractions based upon eigenvalues. A measure of sample adequacy (MSA) was performed to ensure that the data were adequate for the

factor analyses (Kim & Mueller, 1978). Satisfactions achieved a sample adequacy MSA rating of .74. According to Kim and Mueller (1978), satisfaction sample adequacy is "middling". See Appendix B for SAS runs.

3. Hypothesis Testing.

Hypothesis two stated that the presence of leadership efficiency was attributed to differences in satisfaction measures among three different types of units. There were significant differences in satisfaction items and units to varying degrees. Testing the satisfaction measures between the three units, differences and interactions were present. One set of the five satisfaction variables and three types of units were tested against the grand mean or composite measure of the leadership application of each of the seven independent variables.

Analysis of variance findings for each of these variables are listed in Appendix B, and summary findings are listed in Table 21 on page 80. The satisfaction scores attained lower coefficients and higher standard deviations than the leadership functions, see Table 19.

Table 19. Simple Statistics for Satisfaction Measures.

Variable	*N*	*Mean*	*Std Dev*	*Coefficient Alphas*
Leadership Efficiency (y1)	**554**	**2.90**	**0.62**	**0.80**
Job Satisfaction	**552**	**3.32**	**1.29**	**0.76**
Supervisor Satisfaction	**551**	**3.37**	**1.23**	**0.77**
Leader Satisfaction	**550**	**2.96**	**1.13**	**0.74**
Unit Satisfaction	**549**	**2.65**	**1.29**	**0.74**
Army Satisfaction	**550**	**3.48**	**1.30**	**0.78**

SAS's "Guided Data Analysis" system suggested that respondent 212 made 1 outlier observation, which violated an assumption of consistency among observations and

satisfaction measures. The observation was considered extreme and removed from the data by the researcher.

Model comparisons were completed to find the best model for each of the satisfactions and unit. From the analysis of variance summary findings, Table 20 depicts the best model statements in support of hypothesis two.

Table 20.

The Best Fitting Model Statements for each Satisfaction Predictor Combined with Unit.

Best Fitting Satisfaction Models
Leadership Efficiency = f(Unit, Job Satisfaction)
Leadership Efficiency = f(Unit, Supervisor Satisfaction)
Leadership Efficiency = f(Leader Satisfaction)
Leadership Efficiency = f(Unit, Unit Satisfaction)
Leadership Efficiency = f(Unit, Army Satisfaction)
Rescaled Leadership Efficiency = f(Supervisor Satisfaction)
Rescaled Leadership Efficiency = f(Unit, Leader Satisfaction, Unit x Leader Satisfaction)
Rescaled Leadership Efficiency = f(Unit, Unit Satisfaction, Unit x Unit Satisfaction)

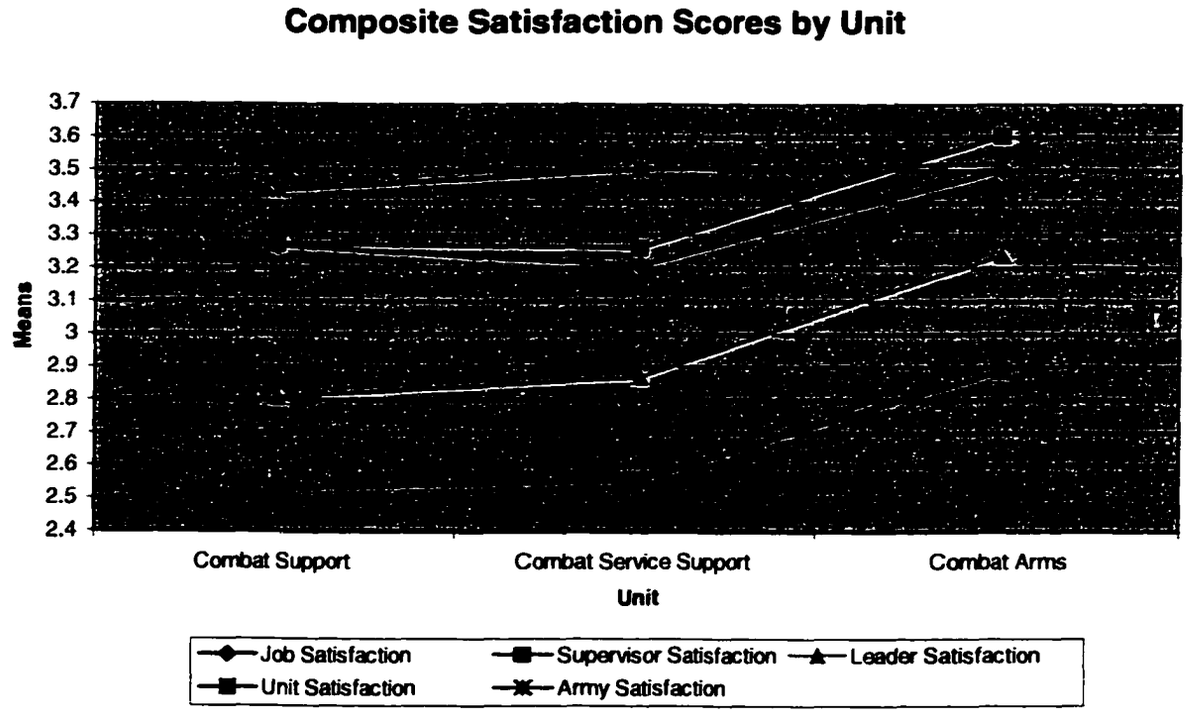


Figure 22. Composite Satisfaction Scores by Unit.

Figure 22 shows similar satisfactions among Combat Service Support Units and Combat Support Units, while Combat Arms Units have the greatest satisfaction levels.

Table 21.

Analysis of Variance for Leadership Efficiency by Unit and Satisfaction (Between Subjects)

Source	Df	F	F
		Leadership Efficiency (y1)	Rescaled Leadership Efficiency (y2)
Unit Actual (X43)	2	4.55*	.77
Job Satisfaction (X37)	1	18.27**	.90
Unit x Job Satisfaction	2	.79	2.99
B within group error	548/546	(.61)	(.48)
Unit Actual (X43)	2	3.56*	.77
Supervisor Satisfaction (X38)	1	41.17**	9.99**
Unit x Supervisor Satisfaction	2	2.80	2.03
B within group error	547/549	(.60)	(.47)
Unit Actual (X43)	2	1.12	7.26**
Leader Satisfaction (X39)	1	146.84**	21.54**
Unit x Leader Satisfaction	2	2.15	8.34**
B within group error	547/543	(.55)	(.45)
Unit Actual (X43)	2	3.02*	6.67**
Unit Satisfaction (X40)	1	91.48**	24.73**
Unit x Unit Satisfaction	2	.65	7.87**
B within group error	545/543	(.57)	(.46)
Unit Actual (X43)	2	5.00**	.77
Army Satisfaction (X41)	1	17.51**	2.33
Unit x Army Satisfaction	2	.65	2.51
B within group error	546/544	(.61)	(.48)

Note. Values enclosed in parentheses represent mean square errors. Cells are nonorthogonal and values follow the Type III sum of squares. Analysis followed the Appelbaum and Cramer (1974) algorithm with the O'Brien Adaptation (Appelbaum & Cramer, 1974). *p < .05. **p <.01. See Appendix B for SAS runs.

The original leadership efficiency application scale analysis was used to detect whether the expected value of the leadership efficiency application score was related to job, supervisor, leader, unit, and Army satisfaction. The observed variation in leadership

efficiency application score is attributable to 5.1% of the variation among predictions based on the value of job-satisfaction, 8.8% for supervisor-satisfaction, 21.1% for leader-satisfaction, 16.1% for unit-satisfaction, and 4.9% for Army-satisfaction. The p-values for these proportions are less than 1%. This constitutes strong statistical evidence that the expected value of the leadership efficiency application score is related to the value of all satisfaction measures.

This analysis was used to detect whether the expected value of the rescaled leadership efficiency application score is related to unit supervisor satisfaction, leader satisfaction, and unit satisfaction. Though SAS's "Guided Data Analysis" suggested a rescaled dependent variable transformation to the power of 2.8, f-values retained their significance. No transformation was done. The observed variation in rescaled leadership efficiency application score was attributable to 1.8% of the variation among predictions based on the value of supervisor-satisfaction, 7.3% for leader-satisfaction, and 6.8% for unit-satisfaction. The p-values for these proportions are less than 1%. This constitutes strong statistical evidence that the expected value of the rescaled leadership efficiency application score is related to the value of supervisor-, leader-, and unit-satisfactions.

The best one-variable satisfaction model was the leader satisfaction variable, with the leadership efficiency application dependent variable. R squared for the leader satisfaction variable was .208, that is 20.8% of the variance in the leader satisfaction variable can be accounted for the leadership efficiency application composite measure. The one main effect model was significant when measuring the leader satisfaction independent variable and the unit ($F=146.84$; $p<.01$). This supports construct validity of the leadership efficiency dependent variable, by indicating group differences in leader

satisfaction to each unit's over and under leadership efficiency applications were significant.

It is important to note the interaction between leader satisfaction and unit, and unit satisfaction and unit. Supposing that leader and unit satisfaction interact with unit types, this would support that unit type differences and satisfaction differences (leader and unit) are significant in determining efficient leadership based on the rescaled leadership efficiency application composite measure ($F=8.6$; $p<.01$) and ($F=7.96$; $p<.01$) respectively.

Hypothesis two states that differences in military leadership efficiency among units can be attributed to individual satisfaction with regard to job, supervisor, leaders, unit, and Army. Expected values of all satisfactions among units are significantly related to the leadership efficiency dependent variable. Rejection of the null hypothesis is warranted.

Hypothesis 3.

Hypothesis Testing.

Hypothesis three stated that the presence of leadership efficiency was attributed to differences in three rank groups among three different types of units. There were significant differences in rank and types of units to varying degrees. Three types of rank and three types of units were tested against the grand mean or composite measure of the leadership application of each of the seven independent variables.

Analysis of variance findings for each of these variables are listed in Appendix C, and summary findings are listed in Table 23. Figures 23 through 25 on pages 85 through 86, depict leadership efficiency application score comparisons with each rank group and

unit type. Model comparisons were completed to find the best model for each rank and unit. From the analysis of variance summary findings, Table 22 depicts the best model statements in support of hypothesis three.

Table 22.

The Best Fitting Model Statements for each Rank Predictor Combined with Unit.

Best Fitting Rank Models
Leadership Efficiency = f(Unit)
Rescaled Leadership Efficiency = f(Rank)

There was no significant relationship or interaction of rank and unit with both leadership efficiency composite measures. Between units however, differences in leadership efficiency perceptions were significantly related ($F=5.98$; $p<.01$). Between ranks were non-significant ($F=1.06$;$p>.05$).

Another set of tests were run using the rescaled dependent variable, the operational measure of leadership efficiency as either efficient or inefficient. There was no significant relationship or interaction of rank and unit with the rescaled leadership efficiency measure ($F=1.62$; $p>.05$). Between units were non-significant at ($F=.50$;$p>.05$). Between rank groups however, a significant relationship existed where soldiers, NCOs, and Officers had a distinct understanding of efficient and inefficient leadership at ($F=3.61$; $p<.05$). See Table 23.

Table 23.

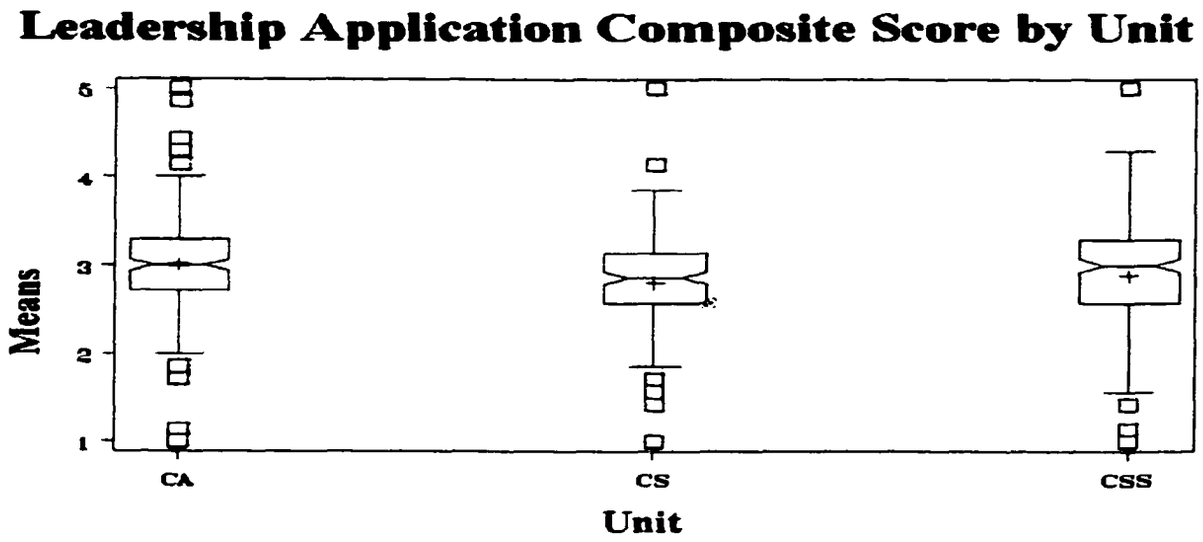
Analysis of Variance for Leadership Efficiency by Unit and Rank (Between Subjects)

Source	Df	F	
		Leadership Efficiency (y1)	Rescaled Leadership Efficiency (y2)
Unit Actual (X43)	2	5.12**	.50
Rank (X32)	2	1.06	3.80*
Unit Actual x Rank	4	1.24	1.62
B within group error	551/545	(.62)	(.47)

Note. Values enclosed in parentheses represent mean square errors. Cells are nonorthogonal and values follow the Type III sum of squares. Analysis followed the Appelbaum and Cramer (1974) algorithm with the O'Brien Adaptation (Appelbaum & Cramer, 1974). *p < .05. **p <.01. See Appendix C for SAS runs.

The analysis is used to detect a statistical difference among the true leadership efficiency application composite means for each different unit level. The observed variation in leadership efficiency application score is attributable to 1.8% of the variation among predictions based on the model. The average variation among the means is 5.12 times the average within-group variation. The p-value for this proportion is less than 1%. This constitutes strong statistical evidence of a difference among the true leadership efficiency application means at different unit levels. Figure 23 depicts leadership efficiency application by unit.

Another analysis was used to detect a statistical difference among the rescaled leadership efficiency application composite means for each rank level. The observed variation in leadership efficiency application score is attributable to 2.3% of the variation among predictions based on the model. The average variation among the means is 3.8 times the average within-group variation. The p-value for this proportion is less than 5%. This constitutes statistical evidence of a difference among the rescaled leadership efficiency application means at different rank levels.



Note. Mean values of 3 equal the proper amount leadership applied or efficient leadership. Values other than 3 depict the degree of leadership inefficiency. Values greater than 3 represent over-compensation leadership application efforts, while less than 3 represent deficient leadership application efforts. Blue squares denote outliers.

Figure 23. Leadership Efficiency Composite Application Scores by Unit.

Figure 24 shows the leadership perception among rank groups. While Officers and NCOs rated themselves slightly inefficient in the training (efficient leadership is a value of 3), soldiers who belong in the lowest rank group perceived their leaders as more inefficient in the training. The lower the rescaled application mean, the more inefficient the leadership application was in the training environment, see Figure 25.

Hypothesis three states that differences in military leadership efficiency among soldiers can be attributed to rank and type of unit. Differences in values of all ranks among units are significantly related to the leadership efficiency dependent variable and the rescaled leadership efficiency dependent variable. In this case, the question answered is that unit types can determine over- and under-compensation efforts, while ranks can determine efficient and inefficient leadership. Cautious rejection of the null hypothesis is warranted.

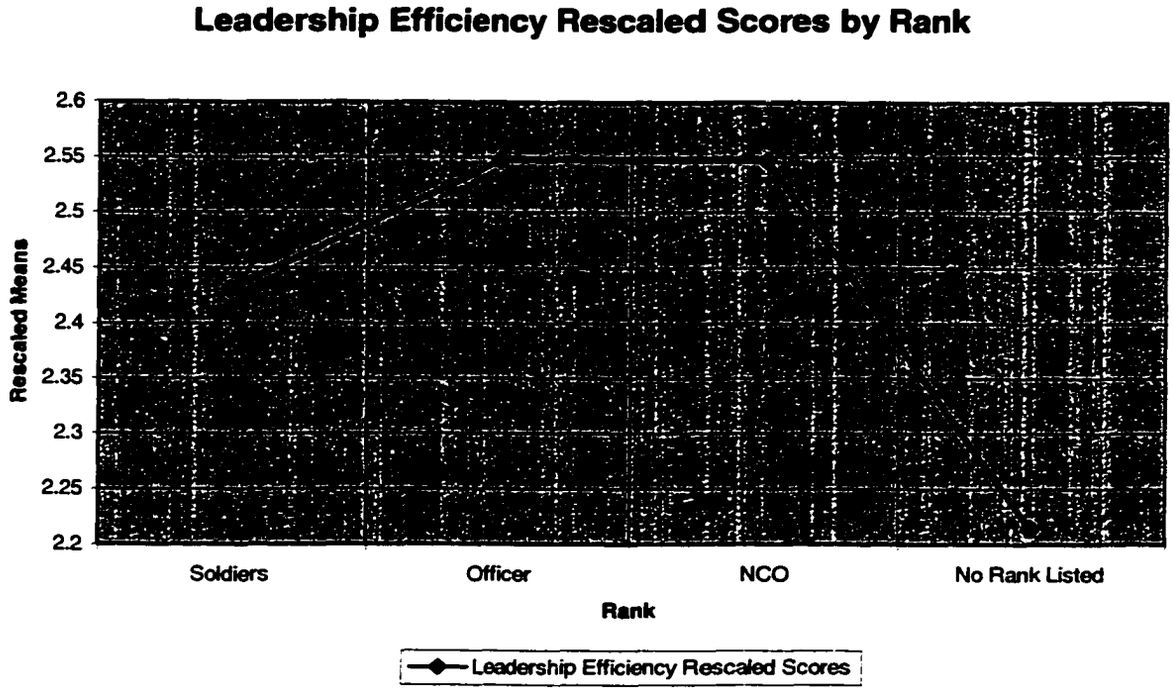
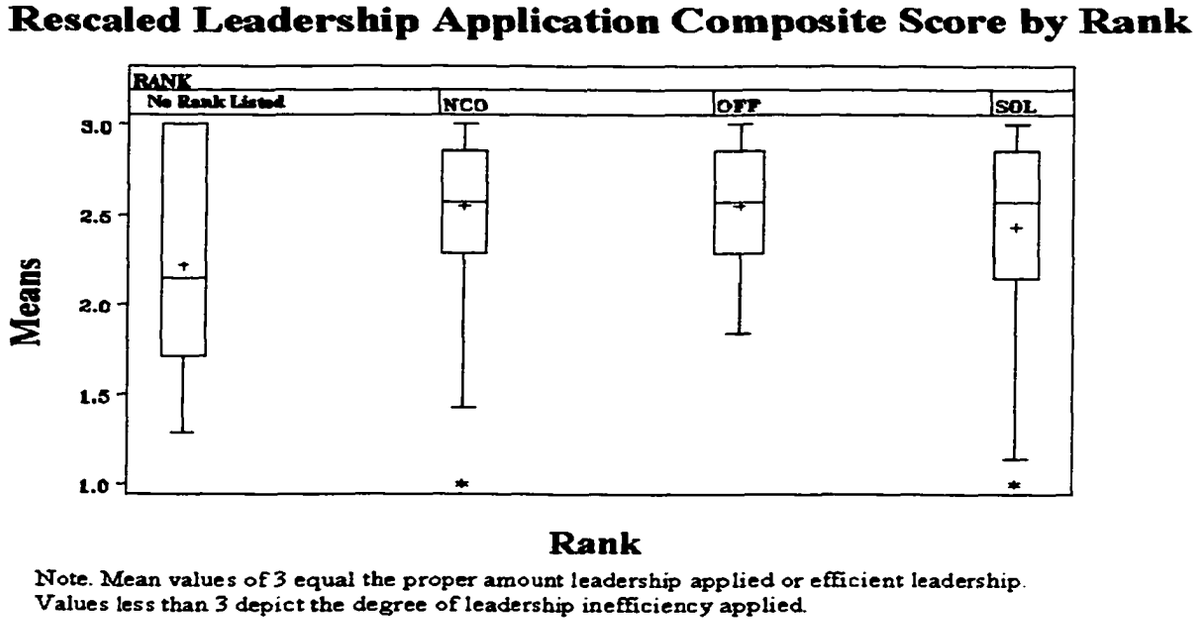


Figure 24. Rescaled Leadership Efficiency Application Composite Scores by Rank.



Note. Mean values of 3 equal the proper amount leadership applied or efficient leadership. Values less than 3 depict the degree of leadership inefficiency applied.

Figure 25. Rescaled Leadership Efficiency Application Composite Scores by Rank. NR = No Response.

CHAPTER 5

Discussion

Overview

The discussion includes a summary of the findings, interpretation, contextual aspects, implications, research issues, limitations, and future directions. The study's intentions were; first to assess perceptions that were situationally appropriate, second to introduce an instrument that supports anonymous feedback, third to coherently measure leadership application, fourth to focus on members in company-sized units after a training event, and fifth to develop models of the factors influencing efficient leadership. It is important to note these intentions in order to establish meaning to this study.

Summary

The study supports previous research of Van Fleet and Yukl (1986) with notable validity restrictions. Noticeable leadership function differences were the organizational influence and situational awareness. Leadership effectiveness and leadership efficiency do have distinct differences in interpretation and measure when applying Van Fleet and Yukl (1986), and Graham et. al. (1999).

A multi-tiered item assessment, as recommended in the prospectus meeting, should include satisfaction measures to provide a contextual control for the situation. Individual satisfactions and perceptions do offer insight to military leadership climates. Groupings between ranks and between units provide team perceptions important in diagnosing military training situations. This leadership efficiency study offers a potential research path important in the timely, situational, reliable, functional, and anonymous feedback crucial to leadership awareness and training.

Interpretation

Hypothesis 1

Three distinct leadership scales were evaluated. The leadership effectiveness scale ranged from not at all to a great deal (See Appendix E). The leadership application or efficiency scale ranged from not much, proper amount, and much too much. The adjusted leadership efficiency scale transformed the leadership application scale by rescaling all 4 and 5 item values on scale one to equal that of 1 and 2 item values to assess the same degree of inefficiency in both directions, based on the modified Hershey, Blanchard, and Johnson (1996) model. The factor analysis of the seven functions revealed a low item weight of organizational influence towards the first factor. Respondents separated organizational influence on the situation from leadership actions within the unit. However, in the second factor solution, organizational influence over leaders in a unit did exist in this study. The higher-headquarter influence measure suggests an external locus of control separate from the leaders within a unit, while the other leadership functions operate within the control of the leaders within the unit.

Between the Combat Arms, Combat Service Support, and Combat Support units and leader's prior abilities there were relationships between unit types and within the abilities in relation to both efficiency scores. Prior-knowledge ability, prior-decision ability, prior-character ability, prior-organization ability, prior-situational awareness ability, and prior-policy ability did show a relationship among units on the leadership application composite score. Differences in these prior effective leadership abilities among units related to the leadership application composite score. One prior-ability, the prior-interaction ability's relationship, revealed an interaction with each unit and

communication in relation to the leadership application composite score. Differences in every prior effective leadership ability relationship revealed an interaction with each unit in relation to the rescaled leadership efficiency scale.

Between the Combat Arms, Combat Service Support, and Combat Support units and leader's during-abilities there were relationships between unit types and within the abilities on both application scores. During-knowledge ability and during-decision ability did show a relationship among units on the leadership application composite score. Differences in these during effective leadership abilities among units related to the leadership application composite score. During-interaction ability, during-character ability, during-organization ability, during-situational awareness ability, and during-policy ability's relationship revealed an interaction with each unit in relation to the leadership application composite score. Differences in every during- leadership ability relationship revealed an interaction with each unit in relation to the rescaled leadership efficiency scale.

Perceptions of both prior and during abilities increased from Combat Service Support Units to Combat Support Units, then to Combat Arms Units. Combat Arms Units' soldiers and leaders perceived the highest abilities both prior and during training based on the inspection of means. An inverse relationship to each unit's organization influence applied during training, where Combat Arms Units perceived higher-headquarters as the most inefficient, then Combat Support Units, and finally Combat Service Support Units. Surprisingly, this could suggest that units who have a more tactical role perceive their unit leadership in a better light. Units such as Combat Service

Support Units, which are the least tactical, perceive their organizations' higher-headquarter leadership in a better light than the more tactical units.

Values depicted in Figure 20 on page 75 suggest over-compensating leadership among all units. The difference in scale not only identifies areas in which leaders need to involve themselves, but areas in which leaders may not have to be involved as much. All validity assessment items related significantly to both leadership scales. This made it difficult to distinguish between scales due to the close relationship of effective and efficiency scales. Conversely, the results of the analysis showed a one item prediction of leadership efficiency which supported the construct and face validity of the study. However, the analysis also showed the highly correlated relationship of effectiveness and efficiency scales supporting the necessary presence of both ability and application in the analysis.

Hypothesis 2

The factor analysis showed two items heavily weighted towards the first and second factors. In this study, the two items were leader and unit satisfaction, which correlated with both leadership efficiency scores. This finding shows concurrent, face and construct support of this study's analyses. Between the Combat Arms, Combat Service Support, and Combat Support Units and leader's satisfactions there were relationships between unit types and within the satisfactions on both efficiency scores.

Again, overall satisfaction climbed from Combat Service Support Units to Combat Support Units, then to Combat Arms Units. Combat Arms Units perceived the highest satisfaction levels. Tactical unit affiliation during this time could be paramount to perceived leadership. Since the study was based upon team/unit leadership perceptions

for units not under the same command and not during the same time, individual leadership can be ruled out. Job satisfaction, supervisor satisfaction, leader satisfaction, unit satisfaction, and Army satisfaction did show a relationship among units on the leadership application composite score. Differences in supervisor satisfaction related to the rescaled leadership efficiency score, while leader satisfaction and unit satisfaction revealed an interaction with each unit in relation to the rescaled leadership efficiency scale. This adds construct validity to the efficient and inefficient leadership practices directly related to leadership and unit satisfaction within company-sized units.

Hypothesis 3

There are significant differences of leadership efficiency between units on the original leadership application scale. Units identified both over and under compensation efforts among leadership functions. Rank however, is nonsignificant due to the values each rank selected over the entire scale. Rank groups among units could not commonly distinguish between over- and under-compensation efforts while collective unit types could.

For the rescaled measure there are significant differences of leadership efficiency between ranks on the rescaled scale for efficient and inefficient leadership, and the degree of inefficiency was taken into account due to similar scale values in the cells between rank types. The rescale goal was to determine the degree of inefficiency. Unit type however, is nonsignificant due to the rescaled values of each unit. Not all values were rescaled; previously 1,2,3 selections were not changed, only 4 and 5 selections were changed to 2,1 respectively to equal the same degree of inefficiency from the proper

amount value which was 3. Unit types could not commonly distinguish between efficient and the two values of inefficient leadership while the ranks could.

Reasons for the differences between unit types and between rank groups, with the two different scales, were based on the scale/rescale composite mean values of the two dependent variables. The "fold over effect" on the rescaled application score was warranted and in line with the modified Hershey, Blanchard, and Johnson (1996) model (Figure 4 on page 23) and the leadership efficiency measures by unit (Figure 19 on page73). However, there are no interactions between unit and rank simultaneously with either scale.

Context

Several contextual aspects of this study must be noted. Each unit surveyed conducted training during separate timeframes and contained training specific to each unit's mission, which is not necessarily similar in nature. Training tasks and task complexity were unknown to the researcher. The focus of study was on the leadership, that led up to and during the training event, which is not conducted formally. This leadership assessment void reflects the lack of available comparative studies (Bass, 1990).

As in O'Hair (1996), environmental, organizational, and individual functions impact the situation. With regard to the environment and organizational function in this study, distinctions must be made to separate perceptual frames. Questions should be adjusted to reflect these distinctions. Leadership perceptions may have been affected by the environmental impact of the terrorist incident on September 11, 2001, for units surveyed after this date. Three units were unavailable due to the heightened force

protection missions due to this incident. However, the analysis does not confirm the environmental impact and it was not investigated.

Implications

Additional improvements to this survey should be considered. Recommended in the prospectus meeting, a three-pronged assessment item approach was used to evaluate the impact of leadership abilities, functions, and satisfactions in this study. One additional item that must be considered is the environmental impact item. This includes an item that should assess the impact of environmental factors into the military training situation, such as the terrorism incident of September 11, 2001.

Fulfilling the "need" for leadership feedback could require a more in-depth assessment among each leadership function and training package to match each inefficient function. The training package could match each unit's inefficiency, by matching the appropriate military leadership-training package to the leadership function and the unit. After the initial efficiency indicator assessment, the training package could include tested treatments that are function, unit, and rank specific. Due to the anonymous nature of the feedback assessments, unbiased administrators not affiliated with the unit could aide the process of obtaining realistic soldier, NCO, and officer perceptions.

Research Issues

Regression analysis may show the ordinal scales too small to depict accurate distances from the proper amount. During the rescaling procedure, one option with only two deviations from the option may not show proper degrees of differences from the proper amount of leadership function applied. Further research encouraging larger Likert

scales, such as 1 to 7 or 1 to 9 may potentially counter regression problems in the future. A balance between time of assessment and precision should be analyzed further.

The researcher noticed sensitivity with the race item, including written sporadic comments and a reluctance to identify race item, such as the description from White to Caucasian and Black to African American. The researcher coded the race item personally.

The goal of this study was to provide a macro assessment with the understanding and sacrifice of precision. The lack of distinction between effectiveness and efficiency scales show that the two are highly related.

Unit access and scheduling were very cumbersome. Assessment dates were approved by unit commanders and were not under the control of the researcher. Though unit commanders were very accommodating and interested in the study, the researcher's access was only granted with the researcher's military credentials. Extra respondents who were available, after the 30- member goal was met were allowed to fill out the survey, and numbers varied from unit to unit.

Limitations

Cook and Campbell (1979) state the importance of linking past research, such as Yukl's and VanFleet's (1986), and understanding the non-causal reasons why the leadership functions might be related, and why differences in leadership efficiency occur in the absence of any explicit treatment of theoretical or practical significance. This is the case when research decisions had to be made rapidly under the auspices of unit commander's priorities. In this case, "randomized experiments may not be suitable, and

some form of quasiexperiment or nonexperiment must be done to view naturally occurring variability and effects" (Cook & Campbell, 1979, p. 344).

Threats to Internal Validity

The soldiers might become aware of the assessment process and how it is calculated, thus affecting ratings by giving certain leaders efficient or inefficient scores. To counter this, no indication or instructions in study computations were given. A one-time administration to each unit should lessen extreme responses. Outliers within the study were identified by SAS's "Guided Data Analysis", and very few respondents had extreme responses.

The pilot survey served as a pretest to support the reliability and validity of the study. After committee approval, the study surveyed soldiers of different units during military training. The results posed significant effects of leadership efficiency, approval was gained from the military, follow-on assessments could be conducted on a regular basis which could administer pretests and posttests to test casual inferences within the unit after assessment means are revealed to the company commanders and a leadership training treatment is applied. Again, the one time administration in place should decrease the effects of "test-wise" participants and lower statistical regression problems. The measurements and calculations were unknown to the participants. The five point Likert scale however, is limited in its range of options within items. Any rescaling limited item range. Cook and Campbell (1979) states, "that the analysis of variance is robust to violations of normality but is less robust to violations of the assumption of uncorrelated errors." A coherent algorithm, Appelbaum and Cramer, with the O'Brian adaptation was

used to increase robustness and add homogeneity to the variance (Appelbaum & Cramer, 1974; Rodgers, 1999).

The Army attempts to minimize selection bias, by arbitrarily assigning soldiers to units based upon Army rotational schedules, and each unit is required to request a personnel fill of their vacant slots monthly to meet the needs of the Army (Department of the Army, 1995, 2000). The Army assigns a soldier of the required rank and military occupational specialty to the unit by computer. As previously stated, this Army policy is not perfect and does not control for selection bias. Random assignment would be the best safeguard against differential selection in this study. however access and unit availability are strictly controlled by unit commanders and random assignment is practically impossible. Researcher manipulation in this case would be extremely difficult and unreasonable across the Army due to lack of time and resources.

Since the units have similar structures throughout the Army, pilot survey participants and post survey participants are assessed separately. Units were assessed separately on separate timeframes for similar type training. Since military training doctrine has not changed, experimental mortality is not an issue in this study.

Maturation selection may have an effect on the interaction. Most leaders are older and have more rank. Participants with higher rank, tried to influence participants of lesser rank during the administration of the survey, though the aim of the study is to capture specific leadership function activity based on soldier and leader perceptions. The effects of rank are minimized on lesser rank by the directions of the researcher to reduce unit leader influence. However, the researcher is an Army officer and has general military

authority over soldiers of lesser rank. The researcher has a higher military rank than all participants and an equal rank to the unit commanders.

The "John Henry effect" (Gall, Borg & Gall, 1996), or enthusiasm towards the study, was monitored and reduced by the anonymous nature of the assessments. When seeking the participant's approval and authorization to participate in the study, the participant was informed of how the study and data gathered would be utilized. The researcher emphasized the privacy importance of the information given, the aggregation of surveys, and the no risk or benefit clause for participation. The participants and unit commanders were informed that this information would have all privacy protection. The participants received nothing in return except for the satisfaction of giving input to the research. No unit has this type of assessment in its operations.

Each unit assessed was unaware of other unit's assessment dates and times. Information exchanged after the researcher left the unit pertaining to the assessment may have affected the soldiers within other units who have not participated in the study. The soldiers may have learned from other soldiers within other units what the assessment contained and discussed answers. Entire one-time unit assessments were desired to reduce this effect. Since the assessment is similar to AARs, each unit does not openly discuss these activities with other units, thereby decreasing these effects.

The leadership measurements in the study utilize a functional concept within an organizational training framework. Both soldiers and leaders move in and out of the area at approximately 10-30% per year (Department of the Army, 2000, 2001). This consistent personnel turnover, due to two and three year overseas tours of duties, created a natural

control for the study. The unit remains intact while the subjects rotate in and out of the unit.

Population Validity

The military population is drawn from units located in Germany, which is an experimentally accessible population. The total Army population worldwide may be assessable through on-line survey assessments, however unit access to the survey would be limited and unlikely. There is a reasonable amount of minimal selection bias inferred in the Army's policies of assignment among its personnel to fill personnel shortages in units, and needs of the Army (Department of the Army, 1995, 2000).

Ecological Validity

The study utilized Army units that train soldiers weekly. Army leadership is evaluated by the Headquarters Training and Doctrine Command and is similar to most structured military leadership venues (Department of the Army, 1999). The Army is a structured hierarchal model and a not-for-profit organization. The units in the study were trained in their military occupational specialty in the tradition of that particular specialty and carry the expectations, standards, and bias as other soldiers in other Army units.

In this study the Hawthorne effect should be minimal. A change in AAR assessment procedures could raise the participants' interest, but units were not aware of the hypotheses. Units conduct several self-assessments to improve performance. In this study unit identification and individual responses were masked.

Since no general assessment exists among units, the "novelty" may impact the initial survey assessments. To address this effect, the questions outlined specific impersonal leadership questions according to proven leadership functions. Anonymity

among survey participants and units should partially counter the novelty and disruption effects. Leaders were unaware of individual unit results. The survey was administered after a scheduled training event familiar to the unit.

The focus of this study is to investigate the possibility of leadership efficiency differences among mandated weekly Army training sessions. The objective is to significantly discover differences in military leadership and how efficiently it is applied. The survey could address other leadership venues such as operational mission after action reviews, for-profit organizations, and other non-related military leadership situations. The military leadership efficiency study has no precedence along with quantifiable approach measures, and therefore unknown outcomes minimize experimental or theoretical bias. The researcher success rate however, was contingent upon access and administration.

The researcher in this study is an active duty Army Officer, and soldiers taking the survey must address the rank of the researcher, which may have had an effect on the participant of lower rank, certainly the return rate reflected this. Out of the 19 units solicited, no company commander refused to participate in the survey. Depending on the situation, if not affected by an operational mission, the company commander was very interested in the study and worked to fulfill the power requirements of the study. Some commanders wanted the feedback; feedback was not given, which shows a subsequent "need" for this type of research. The researcher simply solicited needed unit types until the power quota was reached for each unit type. Individual unit names were ignored and remained anonymous.

Instead of reading the directions to each unit, a modified application Likert-scale may include, 1-2-3-2-1, to avoid the two-scale identification and minimize researcher

involvement in the administration of the survey. Items could then be coded to reflect the 1-5 scale to identify over and under-compensation efforts. The researcher read the directions and coded the items correctly in the study.

Units were surveyed only once to minimize test sensitization. The minimization of attitude shifts among the same units in perception during different situations was the aim of the analysis. Pretest and posttest sensitization is nonexistent in this study.

Generalization may be limited to the time period in which an experiment was done. At a later time, a repeat of the study or administration of subsequent surveys might find no difference, because soldiers and leaders no longer see the method as innovative. To counter these effects, a future study may require a meta-analysis similar to Van Fleet and Yukl's (1998) research to check long-term applicability.

The generalizability of an experiment might be limited by the pilot survey and posttest designed to measure gains/losses or another outcome variable. Differences could possibly surface if both the pilot survey and posttest structures asked for more or less interval and ratio measures. A limited survey administration time of 15-20 minutes is a factor in conducting the surveys. As stated previously, the analysis is a general assessment and does not assess in detail micro-variables within each function. Highly related variables did make it difficult to distinguish between variances, due to the macro assessment goal of the study.

Administration of a pilot survey and posttest were at the completion of training sessions and after the training AAR. The survey followed immediate military training events to effectively assess real time perceptions. There are no treatments in this design;

this study only assessed the efficiency of leadership within a unit and the patterns of perceptions of a group of units and ranks.

Future Directions

As an indicator for leadership training and application this assessment has potential. The survey could possibly lead to a more defined or subsequent assessments under each function. Continued research would balance the need for a quick assessment fulfilling the need for immediate feedback indicators and the precision or distinct phenomenology of the application. The modified Deming model (Figure 26), may graphically depict these means as leadership performance indicators.

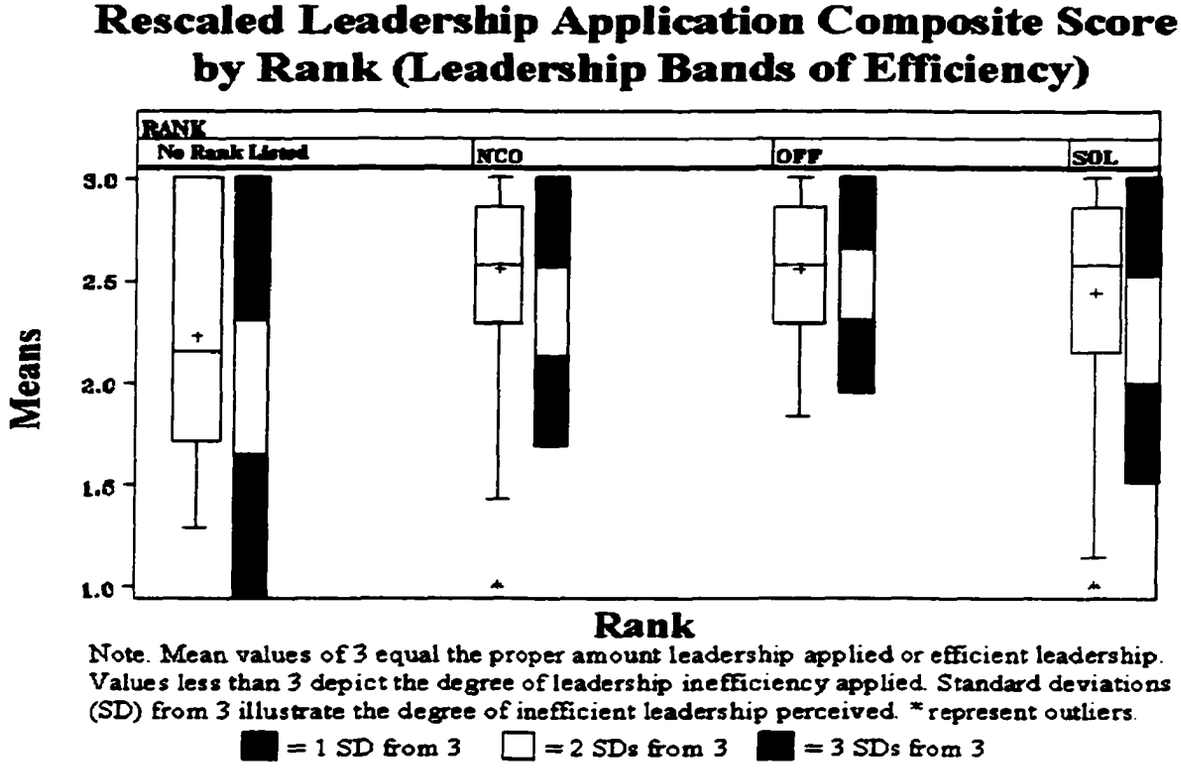


Figure 26. Rescaled Leadership Application Score by Rank representing Leadership Bands of Efficiency.

Figure 26 represents a modified Deming model based upon the rescaled leadership application score, which was significant by each rank group. The color-coded bands could represent inefficient tolerance levels by each standard deviation from the proper amount applied, and indicate a "need" for leadership training for certain rank groups or units for each leadership function. With subsequent assessments the modified stochastic model as shown in Figure 3 on page 22 may be modified to track weekly unit training sessions over the course of a year. Figure 16 on page 70 values could be applied in a time series, to give a commander a snapshot of leadership applications.

Zaccaro's (1996) subsequent or hierarchal assessment processes offer challenging assessment techniques to follow initial diagnoses of military training situations. The research of assessment techniques will require researchers to become more involved in the training environment in order to obtain access and feedback. While indicator research leaves many questions as to causation, sources of influence, confounding, cognitive aspects, and task complexity, systems indicators potentially offer the efficient use of behavioral resources in military training settings (Zaccaro et al., 1999). Subsequent experimental research which involves treatments, randomization, and control groups should be implemented as possible to further the study of this phenomena.

With proper assessment planning, the generation of constructive feedback mechanisms to the company commanders, and access, the more supportive leadership training venues are with limited and varying time windows depending on the individual, organization, and environment. Rank and unit distinctions between leadership's over- and under-compensation efforts, and efficient and inefficient leadership differences warrant subsequent leadership research in this area.

The next step is to implement this assessment in conjunction with the unit level AARs. Through field observations, commanders and unit leaders have shown sufficient "need" for perceptual leader assessment. No situational appropriate tool is available for commanders or unit leaders to assess climates quickly. Problems may arise without these types of analyses to the detriment of the unit or mission. This study has shown the potential for multi-tiered macro and micro assessments for leadership effectiveness and efficiency measures utilized together to aid commanders and unit leaders in diagnosing situational leadership climates in the military training environment. After further validation with other units stateside, a brief to the commander of Headquarters Department of the Army, Training and Doctrine Command, is required to begin full implementation of situational leadership assessment of Army training operations. General of the Army George C. Marshall (FM 22-100), speaking to officer candidates in September 1941, identified leadership efficiency in the context of the military training environment and summed up the importance of this study;

> When you are commanding, leading [soldiers] under conditions where physical exhaustion and privations must be ignored, where the lives of [soldiers] may be sacrificed, then, the efficiency of your leadership will depend only to a minor degree on your tactical ability. It will primarily be determined by your character, your reputation, not much for courage—which will be accepted as a matter of course—but by the previous reputation you have established for fairness, for that high-minded patriotic purpose, that quality of unswerving determination to carry through any military task assigned to you. (p. 1-14)

References

Appelbaum, E., Cramer, M. (1974). Problems in the nonorthogonal analysis of variance. Psychological Bulletin, 81, 335-343.

Bass, B. (1990). Handbook of leadership: theory research and managerial applications (3rd ed). New York, NY: Simon and Schuster.

Bass, B. (1998). Transformational leadership: industry, military, and educational impact. Mahwah, NJ: Lawrence Erlbaum associates, Publishers.

Burba, E. (1999) Infantry situation awareness (SA) workshop. Unpublished internet site, http://wwwari.army.mil/situationawareness/. Fort Benning, GA: U.S. Army Research Institute.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed). Hillsdale, NJ. Lawrence Erlbaum Associates.

Cook, T., Campbell, D. (1979). Quasi-experimentation design & analysis issues for Field Settings. Hopewell, NJ.: Houghton Mifflin Company.

deLeon, L. (1994, Spring) The professional values of public managers, policy analysts and politicians. Public Personnel Management, 23 (1), 135-152.

Department of the Army (2000). Brief to the chief of staff of the army on operational tempo. Unpublished presentation slides 1-13. Washington, DC: HQ FORSCOM.

Department of the Army (April, 1999). Army regulation 601–280: personnel procurement army retention program. Washington, DC: Department of the Army.

Department of the Army (August, 1999). Field manual 22-100: military leadership. Washington, DC: HQ TRADOC.

Department of the Army (June, 1994). Department of the army pamphlet 350–20: unit equal opportunity training guide. Washington, DC: HQ Department of the Army.

Department of the Army (March, 1995). Army regulation 601–210: personnel procurement regular army and army reserve enlistment program. Washington, DC: Department of the Army.

Department of the Army (November, 1988). Field manual 25-100: training the force. Washington, DC: HQ TRADOC.

Department of the Army (November, 2001). Army regulation 200-1: unit status reporting. Washington, DC: Department of the Army.

Department of the Army (October, 1986). Department of the army pamphlet 600-69: unit climate profile commander's handbook. Washington, DC: HQ Department of the Army.

Department of the Army (September, 1990). Field manual 25-101: battle focused training. Washington, DC: HQ TRADOC.

Department of the Army (September, 1997). Field manual 101-5-1: operational terms and graphics. Washington, DC: HQ TRADOC.

Evans, K. (1999) Infantry situation awareness (SA) workshop. Unpublished internet site, http://www-ari.army.mil/situationawareness/. Fort Benning, GA: U.S. Army Research Institute.

Gal, R., Mangelsdorff, D. (1991) Handbook of military psychology. New York, NY: John Wiley & Sons, Inc.

Gall, M., Borg, W., Gall, J. (1996). Education research an introduction (6th ed). White Plains, NY: Longman Publishers.

Graham, S., Matthews, M., Maggart, L., Hubal, R. (1999). Infantry situation awareness (SA) workshop. Unpublished internet site, http://www-ari.army.mil/situationawareness/. Fort Benning, GA: U.S. Army Research Institute.

Harris, E. (1993). Applied organizational communication: perspectives, principles, and pragmatics. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Hermalin, B. (1995, December). Toward an economic theory of leadership. The Economic Review, 88, (5), 1188-1206.

Herschbach, D. (1997, January-February) Improving training quality in developing countries: towards greater instructional efficiency. (Skills Training in Developing Countries: Financial and Planning Issues). International Journal of Manpower, 18,(1-2), 90-118.

Hershey, P., Blanchard, K., Johnson, D. (1996). Management of organizational behavior: utilizing human resources (7th ed). Upper Saddle River, NJ: Prentice-Hall.

Impara, J., Plake, B. (1998) The thirteenth mental measurements yearbook. Lincoln, NE.: Buros Institute of Mental Measurements.

Kim, J., Mueller, C. (1996). Factor analysis statistical methods and practical issues. Newbury Park, CA.: Sage Publications.

Ledlow, G. (1999). Healthcare demand management system communication among the primary care provider, the beneficiary, and the nurse call center. (Doctoral Dissertation, University of Oklahoma, 1999).

Maggart, L., Hubal, R. (1999) Infantry situation awareness (SA) workshop. Unpublished internet site, http://www-ari.army.mil/situationawareness/. Fort Benning, GA: U.S. Army Research Institute.

Maxwell, S., Delaney, H. (1990). Designing experiments and analyzing data. Pacific Grove, CA: Brooks/Cole Publishing Company.

Moore, M. (1995). Creating public value; strategic management in government. Cambridge, MA: Harvard University Press.

Novelli, L., Taylor, S. (1993, September-October). The context for leadership in 21st-century organizations: a role for critical thinking. American Behavioral Scientist, 37 (1), 139-147.

O'Hair, D., (1996) Communication model. Norman, OK: University of Oklahoma.

Pawar, B., Eastman, K. (1997, January). The nature and implications of contextual influences on transformational leadership: a conceptual examination. Academy of Management Review, 22(1), 80-110.

Pew, R., Busemeyer, J., Carley, K., Connolly, T., Corson, J., Funk, K., John, B., Shiffrin, R., Zacharias, G. (1998). Modeling human and organizational behavior. Washington, DC: National Academy Press.

Phillips, D. (1992). Lincoln on leadership; executive strategies for tough times. New York, NY: Warner Books.

Roberts, N. (1997, March-April) Public deliberation: an alternative approach to crafting policy and setting direction. Public Administration Review, 57(2), 124-132.

Rodgers, J. (1999). Psychological statistics II PSY 5013-804. University of Oklahoma, Norman, OK.

Singer, J., Beyer, J., Biggart, N., Burke, W., Cameron, K., DeVries, D., Diehl, P., Huber, G., Kahn, R., Wall, J., Wattendorf, J., Williamson, M., Yukl, G. (1997). Enhancing organizational performance. Washington, DC: National Academy Press.

The SAS System for Windows (1989-1996). Guided data analysis. Release 6.12. Cary, NC: The SAS Institute Inc.

Trott, M., Windsor, K., (1999, May) Leadership effectiveness: how do you measure up?. Nursing Economics, 17(3), 127.

Walton, M. (1986). The deming management method. New York, NY: The Berkley Publishing Group.

Wheatley, M. (1994). Leadership the new science. San Francisco, CA: Berrett-Koehler Publishers, Inc.

Wildavsky, A. (1985). Cultural theory leadership. University of Oklahoma, PSC 6173 Section 801. Supplemental Readings, 87-113.

WWWebster (1999-2002). Internet site. http://www.m-w.com/dictionary.htm. Editor, Merriam-Webster Inc.

Yukl, G. (1998) Leadership in organizations (4th ed). Upper Saddle River, NJ: Prentice-Hall.

Yukl, G., Van Fleet, D. (1986) Military leadership: an organizational perspective (3rd vol). Greenwich, CT: JAI Press Inc.

Zaccaro, S. J. (1996). Models and theories of executive leadership: a conceptual/empirical review and integration. Alexandria, VA: Army Research Institute (ARI).

Zaccaro, S., Mumford, M., Connelly, M., Marks, M., Gilbert, J. (1999, April). Leadership assessment; assessment of leader problem solving capabilities. Leadership Quarterly. Revised Text.

Zaccaro, S., Mumford, M., Harding, F., Jacobs, T., Fleishman, E. (1999, April). Leadership skills for a changing world: solving complex social problems. Leadership Quarterly. Revised Text.

Appendix A

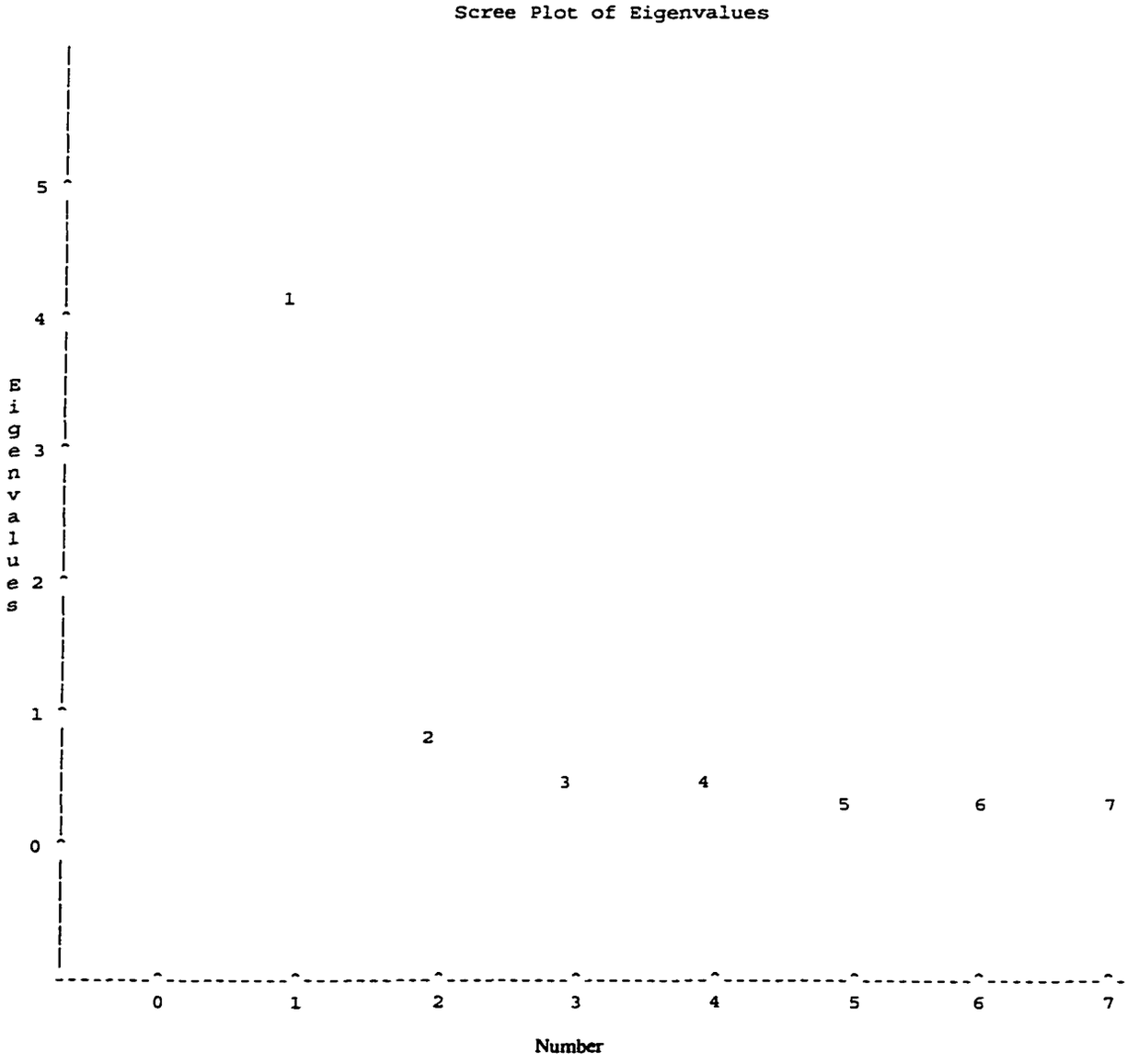
1. Factor Analysis for Prior Abilities.

Kaiser's Measure of Sampling Adequacy for Prior Abilities

Kaiser's Measure of Sampling Adequacy: Over-all MSA = 0.90967151

KNPRIOR	DMPRIOR	INTPRIOR	CHPRIOR	ORGPRIOR	SITPRIOR	POLPRIOR
0.912171	0.890750	0.912377	0.916073	0.923254	0.908549	0.915436

Scree Plot for Prior Abilities



Factor Analysis Varimax Rotation for Prior Abilities

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2
1	0.78651	0.61758
2	-0.61758	0.78651

Rotated Factor Pattern

	FACTOR1	FACTOR2
KNPRIOR	0.57097	0.49266
DMPRIOR	0.65333	0.46029
INTPRIOR	0.67575	0.33662
CHPRIOR	0.64059	0.34971
ORGPRIOR	0.22546	0.45619
SITPRIOR	0.55423	0.52423
POLPRIOR	0.56734	0.53158

Variance explained by each factor

FACTOR1	FACTOR2
2.299725	1.455689

Final Communality Estimates: Total = 3.755414

KNPRIOR	DMPRIOR	INTPRIOR	CHPRIOR	ORGPRIOR	SITPRIOR	POLPRIOR
0.568718	0.638701	0.569958	0.532658	0.258936	0.581992	0.604449

Cronbach Coefficient Alpha for Prior Abilities on Original Leadership Scale

for RAW variables : 0.882210
for STANDARDIZED variables: 0.885525

Deleted Variable	Raw Variables Correlation with Total	Raw Variables Alpha	Std. Variables Correlation with Total	Std. Variables Alpha
TESTEFF	0.558457	0.879039	0.557782	0.880789
KNPRIOR	0.702649	0.861847	0.700838	0.866608
DMPRIOR	0.745257	0.857183	0.742616	0.862344
INTPRIOR	0.686953	0.863501	0.686622	0.868047
CHPRIOR	0.677687	0.864502	0.680342	0.868680
ORGPRIOR	0.433491	0.891342	0.437657	0.892201
SITPRIOR	0.721201	0.859833	0.720741	0.864584
POLPRIOR	0.725954	0.859588	0.723007	0.864352

Cronbach Coefficient Alpha for Prior Abilities on Rescaled Leadership Scale

for RAW variables : 0.869073
for STANDARDIZED variables: 0.864598

Deleted Variable	Raw Variables Correlation with Total	Raw Variables Alpha	Std. Variables Correlation with Total	Std. Variables Alpha
TOTEFF	0.307609	0.879039	0.307813	0.880789
KNPRIOR	0.701809	0.843994	0.695987	0.838820
DMPRIOR	0.746791	0.838568	0.742201	0.833451
INTPRIOR	0.685249	0.845838	0.681020	0.840542
CHPRIOR	0.676050	0.846938	0.677879	0.840902
ORGPRIOR	0.422434	0.877273	0.416157	0.869624
SITPRIOR	0.716583	0.842219	0.709292	0.837283
POLPRIOR	0.722972	0.841824	0.713073	0.836845

2. Hypothesis Testing for Prior Abilities.

Original Leadership Scale Testing for Prior Abilities

General Linear Models Procedure

Class Level Information

Class	Levels	Values
UNITACTL	3	CA CS CSS

Number of observations in data set = 554

NOTE: Due to missing values, only 553 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	44.39522049	14.79840683	48.45	0.0001
Error	549	167.69618110	0.30545752		
Corrected Total	552	212.09140159			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.209321	19.02913	0.55268212	2.90440024

Source	DF	Type III SS	Mean Square	F Value	Pr > F
KNPRIOR	1	40.04627712	40.04627712	131.10	0.0001
UNITACTL	2	3.72684076	1.86342038	6.10	0.0024

Number of observations in data set = 554

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	45.79472158	15.26490719	49.56	0.0001
Error	550	169.39411296	0.30798930		
Corrected Total	553	215.18883453			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.212812	19.12877	0.55496783	2.90122056

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.85535371	1.42767686	4.64	0.0101
DMPRIOR	1	41.86563011	41.86563011	135.93	0.0001

Number of observations in data set = 554

NOTE: Due to missing values, only 552 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	44.86232386	8.97246477	28.92	0.0001
Error	546	169.40280414	0.31026155		
Corrected Total	551	214.26512800			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.209378	19.18446	0.55701126	2.90345066

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.31867049	0.65933524	2.13	0.1204
INTPRIOR	1	38.40962969	38.40962969	123.80	0.0001
INTPRIOR*UNITACTL	2	2.09814050	1.04907025	3.38	0.0347

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	48.93402456	16.31134152	53.81	0.0001
Error	547	165.82652666	0.30315636		
Corrected Total	550	214.76055121			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.227854	18.98925	0.55059636	2.89951603

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.15940394	1.57970197	5.21	0.0057
CHPRIOR	1	45.02692784	45.02692784	148.53	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	28.67801262	9.55933761	28.59	0.0001
Error	547	182.86960211	0.33431372		
Corrected Total	550	211.54761493			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.135563	19.90579	0.57819868	2.90467548

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	5.59851249	2.79925624	8.37	0.0003
ORGPRIOR	1	24.22533283	24.22533283	72.46	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 547 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	50.40026317	16.80008772	58.17	0.0001
Error	543	156.82465983	0.28881153		
Corrected Total	546	207.22492300			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.243215	18.49386	0.53741188	2.90589362

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.83492487	1.41746244	4.91	0.0077
SITPRIOR	1	45.74896705	45.74896705	158.40	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 550 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	47.55595541	9.51119108	31.62	0.0001
Error	544	163.61520930	0.30076325		
Corrected Total	549	211.17116471			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.225201	18.88168	0.54841887	2.90450216

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.21732820	0.60866410	2.02	0.1332
POLPRIOR	1	41.14055049	41.14055049	136.79	0.0001
POLPRIOR*UNITACTL	2	2.71591791	1.35795896	4.52	0.0114

Number of observations in data set = 554
NOTE: Due to missing values, only 547 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	55.24148671	11.04829734	39.28	0.0001
Error	541	152.15335027	0.28124464		
Corrected Total	546	207.39483698			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.266359	18.24299	0.53032503	2.90700792

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.67836441	0.83918220	2.98	0.0514
OVRABPR	1	43.90684125	43.90684125	156.12	0.0001
OVRABPR*UNITACTL	2	2.58397526	1.29198763	4.59	0.0105

Number of observations in data set = 554
NOTE: Due to missing values, only 548 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	51.36364570	17.12121523	59.92	0.0001
Error	544	155.44996007	0.28575360		
Corrected Total	547	206.81360577			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.248357	18.41233	0.53455926	2.90326729

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	4.33398008	2.16699004	7.58	0.0006
EFFPR	1	46.78533762	46.78533762	163.73	0.0001

Rescaled Leadership Scale Testing for Prior Abilities

Number of observations in data set = 554
NOTE: Due to missing values, only 553 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	11.39179472	2.27835894	11.08	0.0001
Error	547	112.46300585	0.20559965		
Corrected Total	552	123.85480057			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.091977	18.35069	0.45343097	2.47092052

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.31348497	1.65674248	8.06	0.0004
KNPRIOR	1	6.33798673	6.33798673	30.83	0.0001
KNPRIOR*UNITACTL	2	3.38273500	1.69136750	8.23	0.0003

Number of observations in data set = 554
Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	13.52558432	2.70511686	13.23	0.0001
Error	548	112.08978492	0.20454340		
Corrected Total	553	125.61536924			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.107675	18.32127	0.45226475	2.46852329

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.83582590	1.91791295	9.38	0.0001
DMPRIOR	1	8.42833276	8.42833276	41.21	0.0001
DMPRIOR*UNITACTL	2	4.02467005	2.01233503	9.84	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 552 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	10.59001164	2.11800233	10.07	0.0001
Error	546	114.79501186	0.21024727		
Corrected Total	551	125.38502350			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.084460	18.56998	0.45852729	2.46918565

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.63040128	1.31520064	6.26	0.0021
INTPRIOR	1	6.90975870	6.90975870	32.86	0.0001
INTPRIOR*UNITACTL	2	2.73011127	1.36505563	6.49	0.0016

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	12.99033466	2.59806693	12.67	0.0001
Error	545	111.78792832	0.20511546		
Corrected Total	550	124.77826298			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.104107	18.35071	0.45289675	2.46800622

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.07712940	1.03856470	5.06	0.0066
CHPRIOR	1	9.20799464	9.20799464	44.89	0.0001
CHPRIOR*UNITACTL	2	2.18502833	1.09251417	5.33	0.0051

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	3.66311276	0.73262255	3.34	0.0055
Error	545	119.40268597	0.21908750		
Corrected Total	550	123.06579873			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.029765	18.95301	0.46806783	2.46962233

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.69058890	0.84529445	3.86	0.0217
ORGPRIOR	1	1.72910118	1.72910118	7.89	0.0051
ORGPRIOR*UNITACTL	2	1.42652028	0.71326014	3.26	0.0393

Number of observations in data set = 554
NOTE: Due to missing values, only 547 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	11.48735142	2.29747028	11.34	0.0001
Error	541	109.62617857	0.20263619		
Corrected Total	546	121.11352999			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.094848	18.19710	0.45015130	2.47375294

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.18419302	1.59209651	7.86	0.0004
SITPRIOR	1	6.97685084	6.97685084	34.43	0.0001
SITPRIOR*UNITACTL	2	3.12440821	1.56220411	7.71	0.0005

Number of observations in data set = 554
NOTE: Due to missing values, only 550 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	9.94689882	1.98937976	9.55	0.0001
Error	544	113.37927723	0.20841779		
Corrected Total	549	123.32617605			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.080655	18.48129	0.45652797	2.47021645

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.22273623	1.61136811	7.73	0.0005
POLPRIOR	1	5.52158209	5.52158209	26.49	0.0001
POLPRIOR*UNITACTL	2	3.17193592	1.58596796	7.61	0.0006

Number of observations in data set = 554
NOTE: Due to missing values, only 547 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	14.77936289	2.95587258	15.06	0.0001
Error	541	106.20380956	0.19631018		
Corrected Total	546	120.98317245			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.122160	17.90904	0.44306905	2.47399669

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	4.12829679	2.06414839	10.51	0.0001
OVRABPR	1	9.07421843	9.07421843	46.22	0.0001
OVRABPR*UNITACTL	2	4.14262181	2.07131091	10.55	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 548 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	14.78991444	2.95798289	15.08	0.0001
Error	542	106.29897478	0.19612357		
Corrected Total	547	121.08888922			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.122141	17.89547	0.44285841	2.47469586

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.63612207	1.31806104	6.72	0.0013
EFFPR	1	10.21430306	10.21430306	52.08	0.0001
EFFPR*UNITACTL	2	2.40436622	1.20218311	6.13	0.0023

3. Factor Analysis for During Abilities.

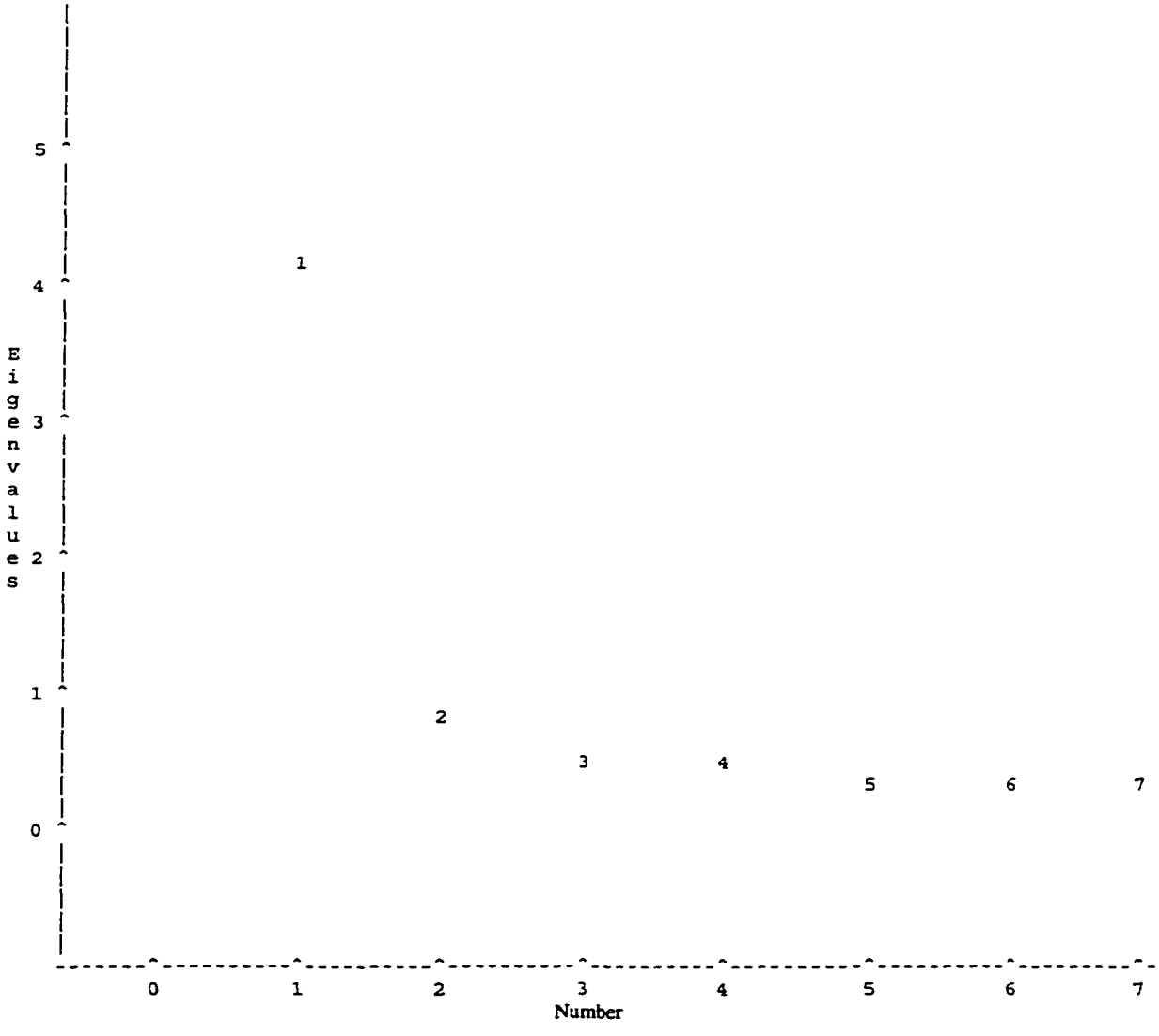
Kaiser's Measure of Sampling Adequacy for During Abilities

Kaiser's Measure of Sampling Adequacy: Over-all MSA = 0.91029042

KNDUR	DMDUR	INTERDUR	CHARDUR	ORGDUR	SITPRIOR	POLDUR
0.902967	0.890775	0.900950	0.921621	0.926138	0.928662	0.916893

Scree Plot for During Abilities

Scree Plot of Eigenvalues



Factor Analysis Varimax Rotation for During Abilities

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2
1	0.77286	0.63458
2	-0.63458	0.77286

Rotated Factor Pattern

	FACTOR1	FACTOR2
KNDUR	0.68159	0.40827
DMDUR	0.70929	0.38708
INTERDUR	0.69707	0.41149
CHARDUR	0.55767	0.51534
ORGDUR	0.19981	0.41565
SITPRIOR	0.45307	0.57082
POLDUR	0.52873	0.57879

Variance explained by each factor

FACTOR1	FACTOR2
2.289316	1.585018

Final Communality Estimates: Total = 3.874334

KNDUR	DMDUR	INTERDUR	CHARDUR	ORGDUR	SITPRIOR	POLDUR
0.631246	0.652925	0.655230	0.576578	0.212694	0.531110	0.614552

Cronbach Coefficient Alpha for During Abilities on Original Leadership Scale

for RAW variables : 0.889675
for STANDARDIZED variables: 0.895527

Deleted Variable	Raw Variables Correlation with Total	Alpha	Std. Variables Correlation with Total	Alpha
TESTEFF	0.590423	0.885758	0.588914	0.890413
KNDUR	0.727265	0.869655	0.728324	0.877347
DMDUR	0.732634	0.869163	0.735267	0.876681
INTERDUR	0.737855	0.868303	0.740128	0.876214
CHARDUR	0.714686	0.870643	0.718515	0.878285
ORGDUR	0.412291	0.904710	0.417636	0.905698
SITDUR	0.753085	0.866580	0.753059	0.874969
POLDUR	0.740443	0.868173	0.739935	0.876233

Cronbach Coefficient Alpha for Prior Abilities on Rescaled Leadership Scale

for RAW variables : 0.875958
for STANDARDIZED variables: 0.874534

Deleted Variable	Raw Variables Correlation with Total	Alpha	Std. Variables Correlation with Total	Alpha
TOTEFF	0.322950	0.885758	0.322950	0.890413
KNDUR	0.725713	0.851079	0.721631	0.849517
DMDUR	0.732347	0.850409	0.731213	0.848467
INTERDUR	0.736042	0.849524	0.733096	0.848260
CHARDUR	0.713270	0.852009	0.713946	0.850357
ORGDUR	0.402301	0.890239	0.400936	0.882833
SITDUR	0.746643	0.848106	0.739008	0.847610
POLDUR	0.739624	0.849317	0.735175	0.848032

4. Hypothesis Testing for During Abilities.

Original Leadership Scale Testing for During Abilities

General Linear Models Procedure

Class Level Information

Class	Levels	Values
UNITACTL	3	CA CS CSS

Number of observations in data set = 554
NOTE: Due to missing values, only 553 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	48.32038446	16.10679482	52.99	0.0001
Error	549	166.85867505	0.30393201		
Corrected Total	552	215.17905951			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.224559	19.00353	0.55130029	2.90104194

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.41377758	1.70688879	5.62	0.0039
KNDUR	1	44.40089820	44.40089820	146.09	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	49.74206350	16.58068783	56.64	0.0001
Error	547	160.13331666	0.29274829		
Corrected Total	550	209.87538016			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.237008	18.61964	0.54106219	2.90586812

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.00711231	1.50355615	5.14	0.0062
DMDUR	1	45.37909656	45.37909656	155.01	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	54.58082365	10.91616473	37.99	0.0001
Error	545	156.60124194	0.28734173		
Corrected Total	550	211.18206559			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.258454	18.45678	0.53604266	2.90431251

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.28257184	1.14128592	3.97	0.0194
INTERDUR	1	46.94874031	46.94874031	163.39	0.0001
INTERDUR*UNITACTL	2	3.04039770	1.52019885	5.29	0.0053

Number of observations in data set = 554
NOTE: Due to missing values, only 547 observations can be used in this analysis.
Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	54.78616774	10.95723355	38.60	0.0001
Error	541	153.56549828	0.28385490		
Corrected Total	546	208.35166602			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.262950	18.34255	0.53278034	2.90461391

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.46874345	0.73437173	2.59	0.0762
CHARDUR	1	45.73377148	45.73377148	161.12	0.0001
CHARDUR*UNITACTL	2	2.59432375	1.29716188	4.57	0.0108

Number of observations in data set = 554
NOTE: Due to missing values, only 549 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	32.07015720	6.41403144	19.22	0.0001
Error	543	181.16639122	0.33363976		
Corrected Total	548	213.23654841			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.150397	19.92737	0.57761558	2.89860352

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.11998961	0.55999481	1.68	0.1876
ORGDUR	1	25.56467312	25.56467312	76.62	0.0001
ORGDUR*UNITACTL	2	2.78993922	1.39496961	4.18	0.0158

Number of observations in data set = 554
NOTE: Due to missing values, only 549 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	61.63140241	12.32628048	44.76	0.0001
Error	543	149.54433042	0.27540392		
Corrected Total	548	211.17573283			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.291849	18.06598	0.52478941	2.90484864

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.28030879	0.64015440	2.32	0.0988
SITDUR	1	53.54559339	53.54559339	194.43	0.0001
SITDUR*UNITACTL	2	2.16366283	1.08183142	3.93	0.0202

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	55.31776730	11.06355346	38.62	0.0001
Error	545	156.12754755	0.28647256		
Corrected Total	550	211.44531485			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.261617	18.42161	0.53523132	2.90545329

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.97245863	0.98622931	3.44	0.0327
POLDUR	1	48.13594882	48.13594882	168.03	0.0001
POLDUR*UNITACTL	2	3.72965808	1.86482904	6.51	0.0016

Number of observations in data set = 554
NOTE: Due to missing values, only 546 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	61.73173861	12.34634772	45.81	0.0001
Error	540	145.53845484	0.26951566		
Corrected Total	545	207.27019345			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.297832	17.84673	0.51914897	2.90893075

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.01165683	1.50582841	5.59	0.0040
OVRDUR	1	49.27618824	49.27618824	182.83	0.0001
OVRDUR*UNITACTL	2	3.90147412	1.95073706	7.24	0.0008

Number of observations in data set = 554
NOTE: Due to missing values, only 547 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	60.79461967	12.15892393	44.42	0.0001
Error	541	148.07653463	0.27370894		
Corrected Total	546	208.87115431			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.291063	18.02445	0.52317200	2.90256812

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.94541789	0.97270894	3.55	0.0293
EFFDUR	1	53.02503235	53.02503235	193.73	0.0001
EFFDUR*UNITACTL	2	3.17670250	1.58835125	5.80	0.0032

Rescaled Leadership Scale Testing for During Abilities

Number of observations in data set = 554
NOTE: Due to missing values, only 553 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	11.88757504	2.37751501	11.46	0.0001
Error	547	113.44481592	0.20739454		
Corrected Total	552	125.33239096			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.094848	18.45570	0.45540591	2.46756221

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.92171335	1.96085667	9.45	0.0001
KNDUR	1	6.62554588	6.62554588	31.95	0.0001
KNDUR*UNITACTL	2	4.09273865	2.04636932	9.87	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	12.80111468	2.56022294	12.68	0.0001
Error	545	110.07007438	0.20196344		
Corrected Total	550	122.87118906			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.104183	18.17703	0.44940343	2.47237058

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.51723051	1.75861526	8.71	0.0002
DMDUR	1	7.85067671	7.85067671	38.87	0.0001
DMDUR*UNITACTL	2	3.59890154	1.79945077	8.91	0.0002

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	11.39920237	2.27984047	11.09	0.0001
Error	545	112.03553349	0.20556979		
Corrected Total	550	123.43473585			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.092350	18.35014	0.45339804	2.47081497

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.87414963	1.43707482	6.99	0.0010
INTERDUR	1	8.21789354	8.21789354	39.98	0.0001
INTERDUR*UNITACTL	2	2.85510472	1.42755236	6.94	0.0011

Number of observations in data set = 554
NOTE: Due to missing values, only 547 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	12.59717069	2.51943414	12.45	0.0001
Error	541	109.45873159	0.20232668		
Corrected Total	546	122.05590228			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.103208	18.18557	0.44980738	2.47343083

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.39873557	1.19936779	5.93	0.0028
CHARDUR	1	8.56517694	8.56517694	42.33	0.0001
CHARDUR*UNITACTL	2	2.43380173	1.21690086	6.01	0.0026

Number of observations in data set = 554
NOTE: Due to missing values, only 549 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	5.29950901	1.05990180	4.83	0.0002
Error	543	119.21487294	0.21954857		
Corrected Total	548	124.51438195			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.042561	18.97580	0.46856010	2.46925145

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.79459401	0.89729701	4.09	0.0173
ORGDUR	1	2.89161071	2.89161071	13.17	0.0003
ORGDUR*UNITACTL	2	1.74162275	0.87081137	3.97	0.0195

Number of observations in data set = 554
NOTE: Due to missing values, only 549 observations can be used in this analysis.
Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	11.85634812	2.37126962	11.62	0.0001
Error	543	110.77421291	0.20400408		
Corrected Total	548	122.63056103			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.096683	18.28399	0.45166810	2.47029231

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.48451652	1.24225826	6.09	0.0024
SITDUR	1	8.26360082	8.26360082	40.51	0.0001
SITDUR*UNITACTL	2	2.65918863	1.32959431	6.52	0.0016

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	12.47671620	2.49534324	12.27	0.0001
Error	545	110.85968515	0.20341227		
Corrected Total	550	123.33640135			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.101160	18.25666	0.45101249	2.47040014

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.83256550	1.41628275	6.96	0.0010
POLDUR	1	7.80234499	7.80234499	38.36	0.0001
POLDUR*UNITACTL	2	2.89222675	1.44611337	7.11	0.0009

Number of observations in data set = 554
NOTE: Due to missing values, only 546 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	14.30955418	2.86191084	14.53	0.0001
Error	540	106.37087575	0.19698310		
Corrected Total	545	120.68042993			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.118574	17.94290	0.44382779	2.47355660

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.78299248	1.89149624	9.60	0.0001
OVRDUR	1	9.29207319	9.29207319	47.17	0.0001
OVRDUR*UNITACTL	2	3.79969154	1.89984577	9.64	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 547 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	17.10885608	3.42177122	17.61	0.0001
Error	541	105.09133934	0.19425386		
Corrected Total	546	122.20019542			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.140007	17.81688	0.44074240	2.47373553

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.60697156	1.30348578	6.71	0.0013
EFFDUR	1	12.58673165	12.58673165	64.80	0.0001
EFFDUR*UNITACTL	2	2.56560882	1.28280441	6.60	0.0015

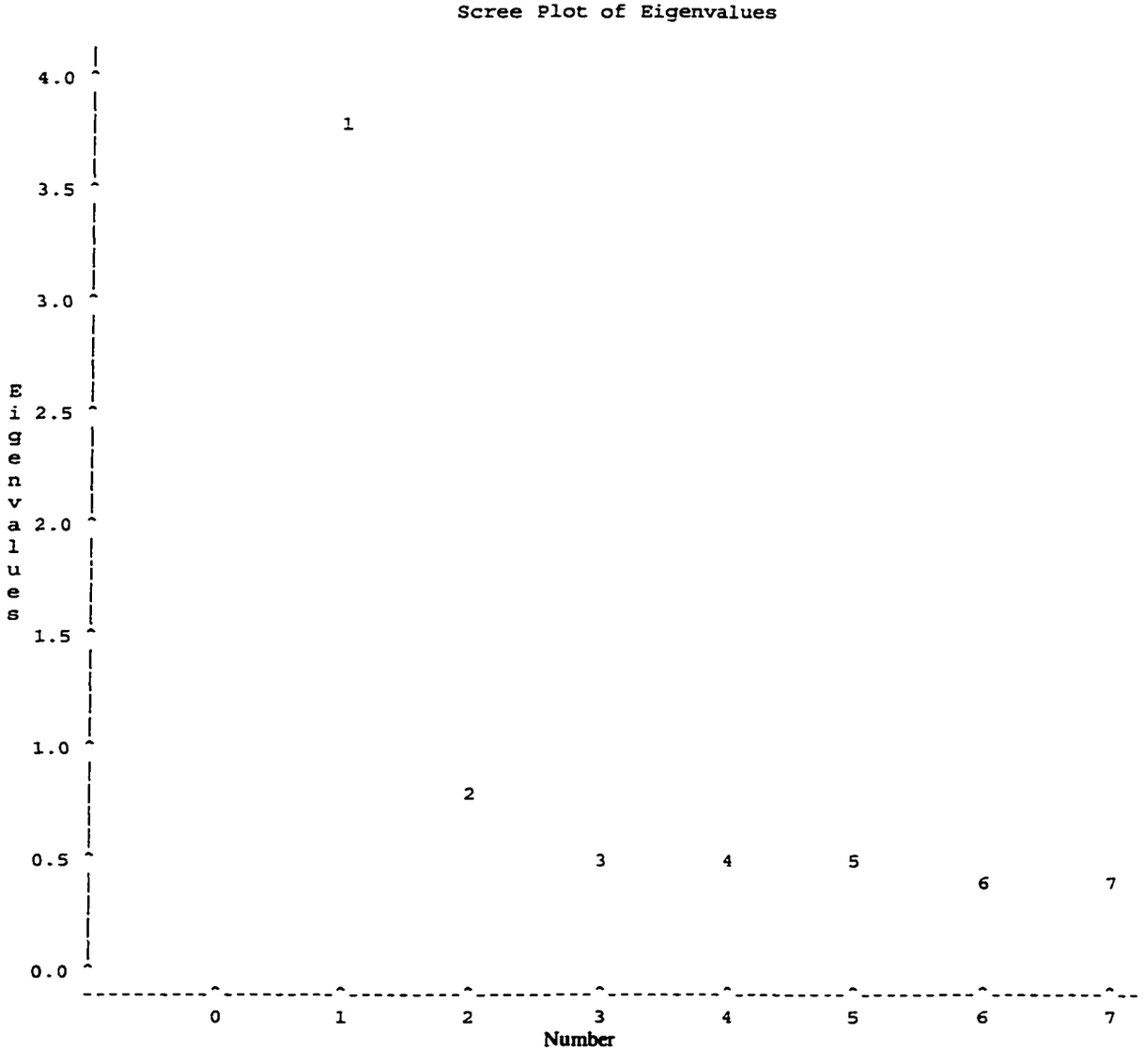
5. Factor Analysis for Leadership Applications.

Kaiser's Measure of Sampling Adequacy for Leadership Applications

Kaiser's Measure of Sampling Adequacy: Over-all MSA = 0.89834174

KNOWLDR	DMLDR	INTLDR	CHARLDR	CRGLDR	SITLDR	POLLDR
0.906485	0.894048	0.891443	0.921456	0.889809	0.891357	0.893526

Scree Plot for Leadership Applications



Factor Analysis Varimax Rotation for Leadership Applications

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2
1	0.77898	0.62704
2	-0.62704	0.77898

Rotated Factor Pattern

	FACTOR1	FACTOR2
KNOWLDR	0.61570	0.34957
DMLDR	0.65734	0.34718
INTLDR	0.65779	0.32004
CHARLDR	0.47211	0.47161
ORGLDR	0.21727	0.49970
SITLDR	0.42968	0.56713
POLLDR	0.58226	0.48704

Variance explained by each factor

FACTOR1	FACTOR2
2.037609	1.376116

Final Communality Estimates: Total = 3.413725

KNOWLDR	DMLDR	INTLDR	CHARLDR	ORGLDR	SITLDR	POLLDR
0.501284	0.552627	0.535108	0.445299	0.296911	0.506260	0.576235

Cronbach Coefficient Alpha for Leadership Applications on Original Leadership Scale

for RAW variables : 0.883871
for STANDARDIZED variables: 0.899875

Deleted Variable	Raw Variables Correlation with Total	Alpha	Std. Variables Correlation with Total	Alpha
TESTEFF	1.000524	0.845196	0.997751	0.855552
KNOWLDR	0.649187	0.869867	0.659338	0.888242
DMLDR	0.672763	0.867316	0.686010	0.885787
INTLDR	0.641997	0.870423	0.657891	0.888375
CHARLDR	0.630231	0.871576	0.636723	0.890308
ORGLDR	0.469488	0.898160	0.475163	0.904646
SITLDR	0.653681	0.869210	0.657406	0.888419
POLLDR	0.707268	0.863832	0.718184	0.882799

Cronbach Coefficient Alpha for Leadership Applications on Rescaled Leadership Scale

for RAW variables : 0.867765
for STANDARDIZED variables: 0.881395

Deleted Variable	Raw Variables Correlation with Total	Alpha	Std. Variables Correlation with Total	Alpha
TOTEFF	1.000329	0.823699	0.999180	0.828476
KNOWLDR	0.563198	0.857751	0.574365	0.873960
DMLDR	0.669487	0.846073	0.679024	0.863319
INTLDR	0.615946	0.852095	0.626571	0.868697
CHARLDR	0.656843	0.847447	0.664575	0.864810
ORGLDR	0.424248	0.878466	0.431602	0.887903
SITLDR	0.584752	0.855546	0.589544	0.872439
POLLDR	0.627429	0.850798	0.635535	0.867784

6. Hypothesis Testing for Leadership Applications.

Original Leadership Scale Testing for Overall Leadership Application

General Linear Models Procedure

Class Level Information

Class	Levels	Values
UNITACTL	3	CA CS CSS

Number of observations in data set = 554

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	107.08732458	21.41746492	108.57	0.0001
Error	548	108.10150995	0.19726553		
Corrected Total	553	215.18883453			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.497643	15.30893	0.44414584	2.90122056

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.09388480	0.54694240	2.77	0.0634
OVREFF	1	96.13119492	96.13119492	487.32	0.0001
OVREFF*UNITACTL	2	1.77571053	0.88785526	4.50	0.0115

Rescaled Leadership Scale for Overall Leadership Application

Number of observations in data set = 554

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	54.51341643	54.51341643	423.21	0.0001
Error	552	71.10195281	0.12880789		
Corrected Total	553	125.61536924			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.433971	14.53898	0.35889815	2.46852329

Source	DF	Type III SS	Mean Square	F Value	Pr > F
OVREFF	1	54.51341643	54.51341643	423.21	0.0001

Appendix B

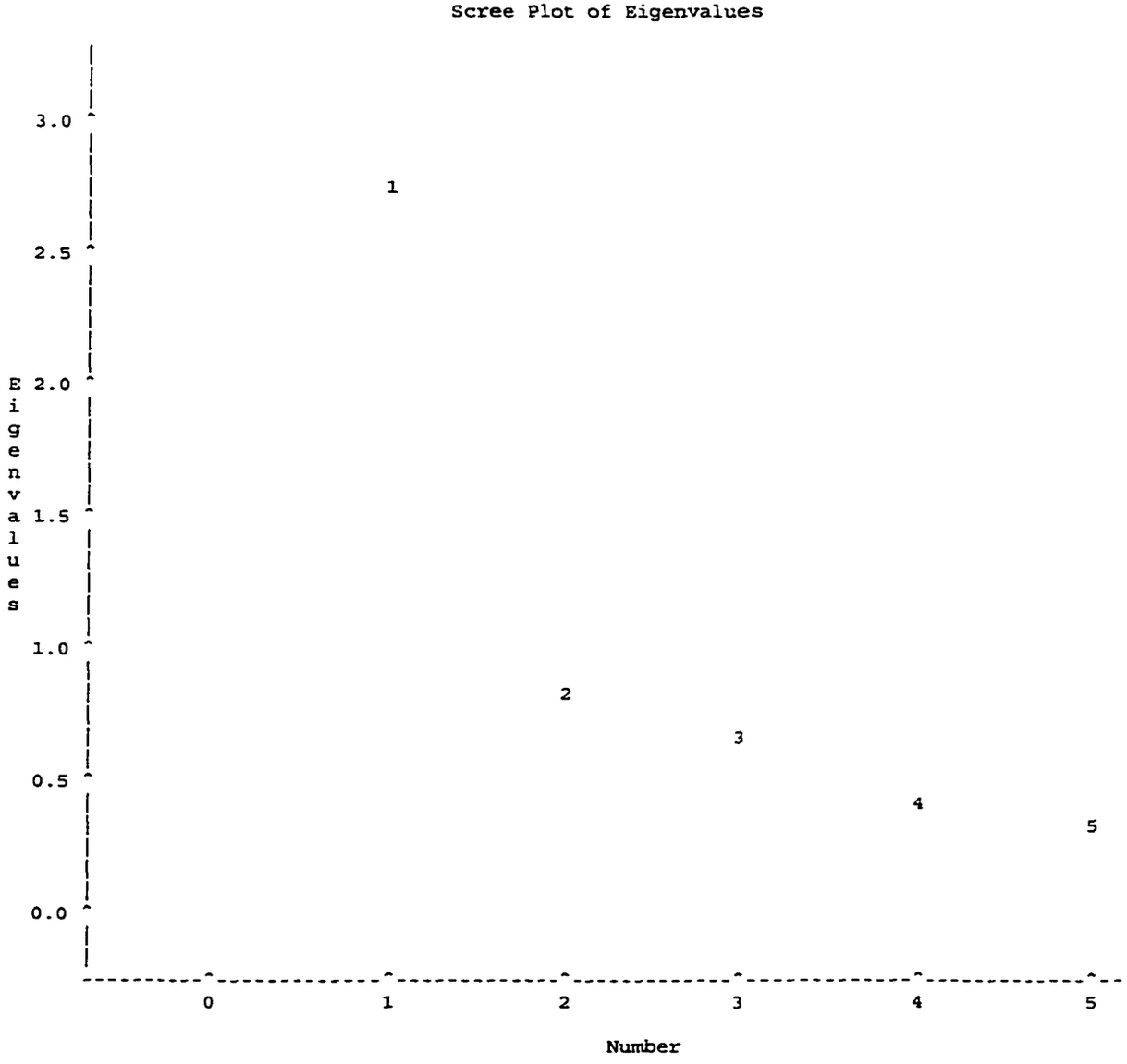
1. Factor Analysis for Satisfaction Measures.

Kaiser's Measure of Sampling Adequacy for Satisfaction Measures

Kaiser's Measure of Sampling Adequacy: Over-all MSA = 0.73637316

JOBSAT	SUPSAT	LDRSAT	UNITSAT	ARMYSAT
0.754928	0.773036	0.693217	0.731076	0.750632

Scree Plot for Satisfaction Measures



Factor Analysis Varimax Rotation for Satisfaction Measures

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2
1	0.75750	0.65283
2	-0.65283	0.75750

Rotated Factor Pattern

	FACTOR1	FACTOR2
JOBSAT	0.33750	0.63342
SUPSAT	0.51611	0.29423
LDRSAT	0.73365	0.25525
UNITSAT	0.63099	0.39982
ARMYSAT	0.25006	0.61646

Variance explained by each factor

FACTOR1	FACTOR2
1.379192	1.092834

Final Communality Estimates: Total = 2.472026

JOBSAT	SUPSAT	LDRSAT	UNITSAT	ARMYSAT
0.515131	0.352943	0.603388	0.558003	0.442560

Cronbach Coefficient Alpha for Satisfaction Measures on Original Leadership Scale

for RAW variables : 0.793956
for STANDARDIZED variables: 0.795828

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
TESTEFF	0.391811	0.797424	0.397757	0.798843
JOBSAT	0.596180	0.750301	0.568364	0.759978
SUPSAT	0.515136	0.770442	0.517321	0.771924
LDRSAT	0.649396	0.738544	0.666981	0.736109
UNITSAT	0.657411	0.733639	0.666387	0.736255
ARMYSAT	0.512014	0.772610	0.489889	0.778231

Cronbach Coefficient Alpha for Satisfaction Measures on Rescaled Leadership Scale

for RAW variables : 0.772426
for STANDARDIZED variables: 0.754209

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
TOTEFF	0.171331	0.797424	0.174339	0.798843
JOBSAT	0.598525	0.716293	0.557761	0.701119
SUPSAT	0.510192	0.740937	0.505384	0.715561
LDRSAT	0.629847	0.710003	0.629513	0.680746
UNITSAT	0.647547	0.701501	0.647407	0.675557
ARMYSAT	0.515371	0.740653	0.486062	0.720799

2. Hypothesis Testing for Satisfaction Measures.

Original Leadership Scale Testing for Satisfaction Measures

General Linear Models Procedure

Class Level Information

Class	Levels	Values
UNITACTL	3	CA CS CSS

Number of observations in data set = 554
NOTE: Due to missing values, only 552 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	10.95952306	3.65317435	9.84	0.0001
Error	548	203.40618909	0.37117918		
Corrected Total	551	214.36571215			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.051125	20.98908	0.60924476	2.90267426

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.37768504	1.68884252	4.55	0.0110
JOBSAT	1	6.78258514	6.78258514	18.27	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	18.85637695	6.28545898	17.59	0.0001
Error	547	195.48104501	0.35736937		
Corrected Total	550	214.33742196			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.087975	20.59067	0.59780379	2.90327543

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.54469996	1.27234998	3.56	0.0291
SUPSAT	1	14.71250541	14.71250541	41.17	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 549 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	43.66470180	43.66470180	146.84	0.0001
Error	547	162.65394071	0.29735638		
Corrected Total	548	206.31864251			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.211637	18.78465	0.54530394	2.90292306

Source	DF	Type III SS	Mean Square	F Value	Pr > F
LDRSAT	1	43.66470180	43.66470180	146.84	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 549 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	34.14464475	11.38154825	34.80	0.0001
Error	545	178.26829909	0.32709780		
Corrected Total	548	212.41294384			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.160747	19.71759	0.57192464	2.90058114

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	1.97693494	0.98846747	3.02	0.0495
UNITSAT	1	29.92387757	29.92387757	91.48	0.0001

Number of observations in data set = 554
NOTE: Due to missing values, only 550 observations can be used in this analysis.

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	10.45209459	3.48403153	9.38	0.0001
Error	546	202.78894421	0.37140832		
Corrected Total	549	213.24103880			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.049015	20.97747	0.60943279	2.90517749

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.71762826	1.85881413	5.00	0.0070
ARMYSAT	1	6.50357130	6.50357130	17.51	0.0001

Rescaled Leadership Scale Testing for Satisfaction Measures

Number of observations in data set = 554
NOTE: Due to missing values, only 551 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	2.23875518	2.23875518	9.99	0.0017
Error	549	123.06298315	0.22415844		
Corrected Total	550	125.30173834			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.017867	19.17392	0.47345374	2.46925936

Source	DF	Type III SS	Mean Square	F Value	Pr > F
SUPSAT	1	2.23875518	2.23875518	9.99	0.0017

Number of observations in data set = 554
NOTE: Due to missing values, only 549 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	8.87478089	1.77495618	8.60	0.0001
Error	543	112.09378294	0.20643422		
Corrected Total	548	120.96856383			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.073364	18.36047	0.45435033	2.47461185

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.99871195	1.49935597	7.26	0.0008
LDRSAT	1	4.44736701	4.44736701	21.54	0.0001
LDRSAT*UNITACTL	2	3.44187584	1.72093792	8.34	0.0003

Number of observations in data set = 554
NOTE: Due to missing values, only 549 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	8.50088139	1.70017628	7.96	0.0001
Error	543	115.94909453	0.21353424		
Corrected Total	548	124.44997592			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.068308	18.71092	0.46209766	2.46966779

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	2.84937506	1.42468753	6.67	0.0014
UNITSAT	1	5.28098055	5.28098055	24.73	0.0001
UNITSAT*UNITACTL	2	3.35998518	1.67999259	7.87	0.0004

Appendix C

Hypothesis Testing for Unit by Rank

Original Leadership Scale Testing for Unit by Rank

General Linear Models Procedure

Class Level Information

Class	Levels	Values
UNITACTL	3	CA CS CSS

Number of observations in data set = 554

Dependent Variable: TESTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3.92909147	1.96454574	5.12	0.0062
Error	551	211.25974306	0.38341151		
Corrected Total	553	215.18883453			

R-Square	C.V.	Root MSE	TESTEFF Mean
0.018259	21.34282	0.61920232	2.90122056

Source	DF	Type III SS	Mean Square	F Value	Pr > F
UNITACTL	2	3.92909147	1.96454574	5.12	0.0062

Rescaled Leadership Scale Testing for Unit by Rank

General Linear Models Procedure

Class Level Information

Class	Levels	Values
RANK	3	NCO OFF SOL

Number of observations in data set = 554

NOTE: Due to missing values, only 548 observations can be used in this analysis.

Dependent Variable: TOTEFF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1.68814941	0.84407471	3.80	0.0230
Error	545	121.13719395	0.22227008		
Corrected Total	547	122.82534336			

R-Square	C.V.	Root MSE	TOTEFF Mean
0.013744	19.07716	0.47145528	2.47130692

Source	DF	Type III SS	Mean Square	F Value	Pr > F
RANK	2	1.68814941	0.84407471	3.80	0.0230

Appendix D

US ARMY MILITARY LEADERSHIP AFTER-ACTION REVIEW PILOT SURVEY
Informed Consent Form For Research Being Conducted Under The Auspices Of The University Of Oklahoma-Norman Campus

I. Research Project Title: Military Leadership Efficiency Among the Units and Soldiers.

A. Conducted by the University of Oklahoma, Norman Campus.

B. This document gives your consent to participate in the project by completing a questionnaire.

II. Researcher Information: The principal researcher is CPT Eric M. Morrison, MA, MS, University of Oklahoma sponsor is Joseph Rodgers, Ph.D.
US Army, West Point sponsor is COL Joseph NG LeBoeuf, Ph.D., Director, Organizational Studies and Military Leadership.

III. Description of Project: The project intends to determine the unique leadership requirements of military leaders and soldiers as they interact and depend on each other to accomplish assigned missions. The underlying assumption is that leadership significantly determines the efficiency of the unit mission training process and soldier leader relationship. Your individual participation will take about ten (10-15) minutes to complete a questionnaire.

IV. Potential Risks and Benefits of Participation: Your name is not part of this questionnaire, so that your individual identity will be kept confidential. All questionnaire data will be aggregated, leaving individual and unit characteristics indiscernible. No other known risks of participation exist. Your participation will benefit the local operation and increase the knowledge available to the military so leadership improvements can be made to increase efficiency for leaders who supervise, direct, and guide soldiers in the accomplishment of assigned missions.

V. Subject Assurances: Your participation is voluntary. No adverse action, loss of benefits, or penalties will impact you if you choose to decline participation. All information will be confidential and aggregated so that your individual identity is protected. Participation is voluntary and any individual can withdraw at any time without penalty. Participants must be over the age of 18. If you have questions regarding your rights as a participant you may contact the Office of Research Administration at (405) 325-4757 or email IRB@ou.edu.

VI. Contact for Additional Information: CPT Eric Morrison, MA, MS at 09662-701093.

_____

Signature of Participant

* Please Separate this form from the Completed Questionnaire.

US ARMY MILITARY LEADERSHIP AFTER-ACTION REVIEW PILOT SURVEY
Unit Commander Authorization For Research Being Conducted Under The Auspices Of The University Of Oklahoma-Norman Campus

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V. Subject Assurances: Your unit's participation is voluntary and any individual can withdraw at any time without penalty. No adverse action, loss of benefits, or penalties will impact you or members of your unit if you choose to decline participation. All information will be confidential and aggregated so that your unit's identity is protected. Participants must be over the age of 18. If you have questions regarding your rights as a participant you may contact the Office of Research Administration at (405) 325-4757 or email IRB@ou.edu.

VI. Contact for Additional Information: CPT Eric Morrison, MA, MS at 09662-701093.

_____
Signature of Unit Commander

* Please Separate this form from the Completed Questionnaire.

LEADERSHIP AFTER-ACTION REVIEW: PILOT EDITION

To What Extent Do You as a Soldier of the Military, View Leadership in Your Unit Concerning Sergeant's Time Training Execution: * *circle one response for each statement*

LEADERSHIP ABILITY LEVELS	Not At All	Somewhat	A Medium Amount	Quite A Bit	A Great Deal
Knowledge					
1. Do you think that your unit's leaders had the necessary knowledge prior to this training?	1	2	3	4	5
2. Was the leaders' knowledge applied to this training?	1	2	3	4	5
Decision-Making					
3. Do you think that your unit's leaders had the necessary planning, management, and execution decision abilities prior to this training?	1	2	3	4	5
4. Were the leaders' planning, management, and execution decision abilities applied to this training?	1	2	3	4	5
Interaction					
5. Do you think that your unit's leaders had the necessary communication abilities prior to this training?	1	2	3	4	5
6. Were the leaders' communication abilities applied to this training?	1	2	3	4	5
Character					
7. Do you think that your unit's leaders had the needed personality characteristics prior to this training?	1	2	3	4	5
8. Were the leaders' personality characteristics applied to this training?	1	2	3	4	5
Organization					
9. Do you think that your unit's higher headquarters had the ability to influence training prior to this training?	1	2	3	4	5
10. Were your higher headquarters' influences applied to this training?	1	2	3	4	5
Situational Awareness					
11. Do you think that your unit's leaders had the necessary awareness abilities to handle potential changes prior to this training?	1	2	3	4	5
12. Was the leaders' awareness to handle potential changes applied to this training?	1	2	3	4	5
Policy and Records					
13. Do you think that your unit's leaders had the necessary administrative abilities prior to this training?	1	2	3	4	5
14. Were the leaders' administrative abilities applied to this training?	1	2	3	4	5

LEADERSHIP MEASUREMENT	Not At All	Not Enough	Right Amount	More Than Needed	Much Too Much
Knowledge					
15. How much do you think that your leaders' knowledge was applied to this training?	1	2	3	4	5
Decision-Making					
16. How much do you think that your leaders' planning, management, and execution decisions were applied to this training?	1	2	3	4	5
Interaction					
17. How much do you think that your leaders' abilities to communicate were applied to this training?	1	2	3	4	5
Character					
18. How much do you think that your leaders' personality characteristics were applied to this training?	1	2	3	4	5
Organization					
19. How much do you think that your higher headquarters' influences were applied to this training?	1	2	3	4	5
Situational Awareness					
20. How much do you think that your leaders' awareness to handle potential changes was applied to this training?	1	2	3	4	5
Policy and Records					
21. How much do you think that your leaders' administrative abilities were applied to this training?	1	2	3	4	5

LEADERSHIP AFTER-ACTION REVIEW: PILOT EDITION
GENERAL INFORMATION

1. What type of unit are you in? (Circle one).

Combat Arms Combat Support Combat Service Support

2. What is your highest education level? (Circle one).

Attended high school/GED
Completed high school/GED
Attended vocational technical college
Completed vocational technical college
Attended undergraduate college
Completed undergraduate college
Attended graduate college
Completed graduate college

3. What is your gender? (Circle one). Male or Female

4. What is your age? _____ years old.

5. What is your Military Occupational Specialty? (Example 11B). _____

6. What is your rank? (Examples SFC, SGT, 1LT, CPT, PFC)._____

7. Have you ever taken this survey before? (Circle one) Yes or No

8. Marital status? Married or Single

9. Do you have children? (Circle one) Yes or No If so, how many?_____

10. Race(Circle one)? White Black Native American Asian Hispanic
Another race type? (Please specify)_____

JOB SATISFACTION	Not At All	Somewhat	A Medium Amount	Quite A Bit	A Great Deal
11. Do you like your job?	1	2	3	4	5
12. Do you like your supervisor?	1	2	3	4	5
13. Do you like the leaders in your unit?	1	2	3	4	5
14. Do you like your unit?	1	2	3	4	5
15. Do you like the US Army?	1	2	3	4	5

16. Do you have any suggestions to make your unit better?_____
_____
_____

All information will be confidential. Data will be aggregated; no individual or unit can be identified. Thank you for providing input for the survey. The Leadership After-Action Review Survey has the potential to improve leadership in our Army.

LEADERSHIP AFTER-ACTION REVIEW: PILOT EDITION
Survey Comments

Were there any questions that you had difficulty or were confusing? If so which one(s) and why?

Appendix E

US ARMY MILITARY LEADERSHIP AFTER-ACTION REVIEW SURVEY
Informed Consent Form For Research Being Conducted Under The Auspices Of The University Of Oklahoma-Norman Campus

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B. This document gives your consent to participate in the project by completing a questionnaire.

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IV. Potential Risks and Benefits of Participation: Your name is not part of this questionnaire, so that your individual identity will be kept confidential. All questionnaire data will be aggregated, leaving individual and unit characteristics indiscernible. No other known risks of participation exist. Your participation will benefit the local operation and increase the knowledge available to the military so leadership improvements can be made to increase efficiency for leaders who supervise, direct, and guide soldiers in the accomplishment of assigned missions.

V. Subject Assurances: Your participation is voluntary. No adverse action, loss of benefits, or penalties will impact you if you choose to decline participation. All information will be confidential and aggregated so that your individual identity is protected. Participation is voluntary and any individual can withdraw at any time without penalty. Participants must be over the age of 18. If you have questions regarding your rights as a participant you may contact the Office of Research Administration at (405) 325-4757 or email IRB@ou.edu.

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_____
Signature of Participant

* Please Separate this form from the Completed Questionnaire.

US ARMY MILITARY LEADERSHIP AFTER-ACTION REVIEW SURVEY
Unit Commander Authorization For Research Being Conducted Under The Auspices Of The University Of Oklahoma-Norman Campus

I. Research Project Title: Military Leadership Efficiency Among the Units and Soldiers.

A. Conducted by the University of Oklahoma, Norman Campus.

B. This document gives your consent to participate in the project by completing a questionnaire.

II. Researcher Information: The principal researcher is CPT Eric M. Morrison, MA, MS, University of Oklahoma sponsor is Joseph Rodgers, Ph.D.
US Army, West Point sponsor is COL Joseph NG LeBoeuf, Ph.D., Director, Organizational Studies and Military Leadership.

III. Description of Project: The project intends to determine the unique leadership requirements of military leaders and soldiers as they interact and depend on each other to accomplish assigned missions. The underlying assumption is that leadership significantly determines the efficiency of the unit mission training process and soldier leader relationship. The individual participation will take about ten (10-15) minutes to complete a questionnaire.

IV. Potential Risks and Benefits of Participation: Individual name is not part of this questionnaire, so that your individual identity will be kept confidential. All questionnaire data will be aggregated, leaving individual and unit characteristics indiscernible. No other known risks of participation exist. Participation will benefit the local operation and increase the knowledge available to the military so leadership improvements can be made to increase efficiency for leaders who supervise, direct, and guide soldiers in the accomplishment of assigned missions.

V. Subject Assurances: Your unit's participation is voluntary and any individual can withdraw at any time without penalty. No adverse action, loss of benefits, or penalties will impact you or members of your unit if you choose to decline participation. All information will be confidential and aggregated so that your unit's identity is protected. Participants must be over the age of 18. If you have questions regarding your rights as a participant you may contact the Office of Research Administration at (405) 325-4757 or email IRB@ou.edu.

VI. Contact for Additional Information: CPT Eric Morrison, MA, MS at 09662-701093.

_____
Signature of Unit Commander

* Please Separate this form from the Completed Questionnaire.

LEADERSHIP AFTER-ACTION REVIEW

To What Extent Do You as a Soldier of the Military, View Leadership in Your Unit Concerning Sergeant's Time Training Execution: * *circle one response for each statement*

LEADERSHIP ABILITY LEVELS	Not At All	Some what	A Medium Amount	Quite A Bit	A Great Deal
Knowledge					
1. Do you think that your unit's leaders had the necessary knowledge **prior** to this training?	1	2	3	4	5
2. Do you think that your unit's leaders had the necessary knowledge **during** this training?	1	2	3	4	5
Decision-Making					
3. Do you think that your unit's leaders had the necessary planning, management, and execution decision abilities **prior** to this training?	1	2	3	4	5
4. Do you think that your unit's leaders had the necessary planning, management, and execution decision abilities **during** this training?	1	2	3	4	5
Interaction					
5. Do you think that your unit's leaders had the necessary communication abilities **prior** to this training?	1	2	3	4	5
6. Do you think that your unit's leaders had the necessary communication abilities **during** this training?	1	2	3	4	5
Character					
7. Do you think that your unit's leaders had the needed personality characteristics **prior** to this training?	1	2	3	4	5
8. Do you think that your unit's leaders had the needed personality characteristics **during** this training?	1	2	3	4	5
Organization					
9. Do you think that your unit's higher headquarters had the ability to influence training **prior** to this training?	1	2	3	4	5
10. Do you think that your unit's higher headquarters had the ability to influence training **during** this training?	1	2	3	4	5
Situational Awareness					
11. Do you think that your unit's leaders had the necessary awareness abilities to handle potential changes **prior** to this training?	1	2	3	4	5
12. Do you think that your unit's leaders had the necessary awareness abilities to handle potential changes **during** this training?	1	2	3	4	5
Policy and Records					
13. Do you think that your unit's leaders had the necessary administrative abilities **prior** to this training?	1	2	3	4	5
14. Do you think that your unit's leaders had the necessary administrative abilities **during** this training?	1	2	3	4	5
Overall Abilities					
15. Do you think that your unit's leaders had the necessary leadership abilities **prior** to this training?	1	2	3	4	5
16. Do you think that your unit's leaders had the necessary leadership abilities **during** this training?	1	2	3	4	5
Efficiency					
17.Do you think that your unit's leaders had the necessary leadership efficiency **prior** to this training?	1	2	3	4	5
18. Do you think that your unit's leaders had the necessary leadership efficiency **during** this training?	1	2	3	4	5

LEADERSHIP MEASUREMENT	Not Much	Less Than Needed	Proper Amount	More Than Needed	Much Too Much
Knowledge					
19. How much do you think that your leaders' knowledge was applied to this training?	1	2	3	4	5
Decision-Making					
20. How much do you think that your leaders' planning, management, and execution decisions were applied to this training?	1	2	3	4	5
Interaction					
21. How much do you think that your leaders' abilities to communicate were applied to this training?	1	2	3	4	5
Character					
22. How much do you think that your leaders' personality characteristics were applied to this training?	1	2	3	4	5
Organization					
23. How much do you think that your higher headquarters' influences were applied to this training?	1	2	3	4	5
Situational Awareness					
24. How much do you think that your leaders' awareness to handle potential changes was applied to this training?	1	2	3	4	5
Policy and Records					
25. How much do you think that your leaders' administrative abilities were applied to this training?	1	2	3	4	5
Overall Leadership Efficiency					
26. How efficient was the overall leadership during this training?	1	2	3	4	5

LEADERSHIP AFTER-ACTION REVIEW
GENERAL INFORMATION

1. What type of unit are you in? (Circle one).

Combat Arms Combat Support Combat Service Support

2. What is your highest education level? (Circle one).

Attended high school/GED
Completed high school/GED
Attended vocational technical college
Completed vocational technical college
Attended undergraduate college
Completed undergraduate college
Attended graduate college
Completed graduate college

3. What is your gender? (Circle one). Male or Female

4. What is your age? _____ years old.

5. What is your Military Occupational Specialty? (Example 11B). _____

6. What is your rank? (Examples SFC, SGT, 1LT, CPT, PFC)._____

7. Have you ever taken this survey before? (Circle one) Yes or No

8. Marital status? Married or Single

9. Do you have children? (Circle one) Yes or No If so, how many?_____

10. Race(Circle one)? White Black Native American Asian Hispanic
Another race type? (Please specify)_____

JOB SATISFACTION	Not At All	Somewhat	A Medium Amount	Quite A Bit	A Great Deal
11. Do you like your job?	1	2	3	4	5
12. Do you like your supervisor?	1	2	3	4	5
13. Do you like the leaders in your unit?	1	2	3	4	5
14. Do you like your unit?	1	2	3	4	5
15. Do you like the US Army?	1	2	3	4	5

16. Do you have any suggestions to make your unit better?_____
_____
_____

All information will be confidential. Data will be aggregated; no individual or unit can be identified. Thank you for providing input for the survey. The Leadership After-Action Review Survey has the potential to improve leadership in our Army.