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AN INVESTIGATION OF THE
 DISTRIBUTION OF POWER
 AND LEADER EFFECTIVENESS
 IN MATRIX ORGANIZATIONS

THESIS

Richard L. Wojick, Jr.
 Captain, USAF

AFIT/GSM/LSR/89S-45

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Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Systems Management

Richard L. Wojick, Jr.
Captain, USAF

September 1989

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To my wife: "Many women do noble things,
but you surpass them all." (Proverbs 31:29)

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Abstract

This research developed and validated new measures of power, based on the widely accepted framework proposed by French and Raven (1959). A review of the literature revealed that previous field studies employing the French and Raven power taxonomy suffer from several methodological limitations -- no power base measures currently exist with adequate reliability and validity. A list of desirable psychometric properties was assembled from several sources, and a well-planned, detailed program of item development and scale testing was carried out to assure that the newly developed measures would possess the desired properties.

Five theoretical construct definitions were developed for reward, coercive, legitimate, expert, and referent powers, based on French and Raven's work. Next, items were generated for each power base that were consistent with the theoretical power definitions. The resultant items were then subjected to a three-phase pilot study to determine those most suitable for further examination. The retained items were next administered, along with various dependent variables, to a sample of project personnel working in matrix organizations. Respondents were asked to describe the behavior of their functional and project managers in terms of the power scales.

Responses from the sample were submitted to four evaluations. First, an assessment of the structure of the new scales was conducted, employing factor analyses, to evaluate the degree of congruency between respondent perceptions and the scales to which items were theoretically assigned. Next, item analyses and internal consistency reliability analyses were carried out to eliminate items which lowered the reliabilities of the new scales. Power scale independence was then assessed by intercorrelating the scales and employing further factor analyses. Finally, the empirical and nomological validity of the new power measures were assessed by performing simple and partial correlation and regression analyses with several dependent variables. The newly developed power scales demonstrated strong psychometric properties.

AN INVESTIGATION OF THE DISTRIBUTION
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I. Introduction

General Issue

Should [the unity of command principle] be violated, authority is undermined, discipline is in jeopardy, order disturbed and stability threatened. This rule seems fundamental to me and so I have given it the rank of principle. As soon as two superiors wield their authority over the same person or department, uneasiness makes itself felt and should the cause persist, the disorder increases, the malady takes on the appearance of an animal organism troubled by a foreign body, and the following consequences are to be observed: either the dual command ends in disappearance or elimination of one of the superiors and organic well-being is restored, or else the organism continues to wither away. In no case is there adaptation of the social organism to dual command (Fayol, 1949:24).

Henri Fayol, the father of modern organization administration, gave this warning more than seventy years ago. Writing in 1916, following thirty years of experience as the highly successful CEO of a large metallurgical combine, Fayol put forth what he called the principle of "unity of command" which states, "For any action whatsoever, an employee should receive orders from one superior only" (Fayol, 1949:22). A matrix organization is "one in which there is a dual or multiple managerial accountability and responsibility" (Stuckenbruck, 1979:21). Put more succinctly, there are two bosses in a matrix organization -- a functional manager and a project manager. A matrix

structure clearly violates the unity of command principle by obliging some members of an organization to report simultaneously to several superiors. In the high technology military-industrial weapons acquisition business, the adoption of matrix structures has reached the point of institutionalization within the last decade (Kerzner, 1989). This virtually exclusive acceptance of matrix management, however, raises the question of how well the personnel in these organizations have adapted to the dual command structure. If Fayol is right, then these matrixed organizations will exhibit a high level of authority ambiguity. Interestingly, while this problem has been written about in numerous articles, there has been no field research investigating the ramifications of the power struggle between the functional and project managers over their matrixed subordinates.

Background

The matrix structure was pioneered in the early 1960s by several major aerospace firms and is an attempt to capture the benefits and minimize the liabilities of two earlier forms of organizations, the functional structure and the project form of organization (Kingdon, 1973:17). The Air Force has found that matrix structures offer operational flexibility and seem particularly well-suited to acquisition activities (Thurber, 1978:17). In fact, beginning in 1976, the Air Force Systems Command (AFSC) adopted matrix management as the principal organizational structure among its product divisions and system program offices (SPOs). After more than a decade of matrix use,

the time has come to put Fayol's warning to a test and assess the effects of the distribution of power between the functional and project manager on subordinates in these matrixed SPOs.

The present era of highly scrutinized defense budgets requires the Air Force to optimize the critical factors of cost, schedule, performance, and readiness in each weapons system development effort. The acquisition of new weapons systems is expensive and a significant portion of the Air Force budget. However, organizational changes which could possibly increase the capability to meet acquisition goals are relatively inexpensive. If SPO personnel are still having trouble adapting to matrix management's dual command structure, it may be time to try something else.

In the SPO matrix, project managers are charged with the responsibility of building multidisciplinary teams into cohesive groups as well as dealing successfully with a variety of interfaces such as functional departments, staff groups, team members, other military commands, and senior management. This is an environment where managerial power is shared by many individuals but primarily with the functional manager. The managers of functional departments, on the other hand, are managers in the traditional sense. They are responsible for staffing and organizing a group which will have the technical competence to handle any project within its province.

By establishing two distinct lines of managerial influence within an organizational structure, the program office is generating "deliberate conflict" between two essential managerial perspectives

(Cleland, 1968:68). In matrix organizations, there are several potential areas in which both project and functional managers can share the authority and responsibility for completing the project. These include: (1) the technical decisions regarding project work activities and solution strategies; (2) the determination of salaries and promotional opportunities; and (3) the staffing and organizational assignments of the project team members to particular project activities (Katz and Allen, 1985). These are critical areas in which project and functional managers contend for power, for it is through these supervisory activities that each principle component represented in the matrix attempts to motivate and direct each subordinate's efforts and performance (Kingdon, 1973). The degree to which each principle component is successful in building its power and influence with the organization will have a strong bearing on subordinate outcomes (Wilemon and Gemmill, 1971). Therefore, obtaining and applying power can be critical to the success or failure of matrix groups in organizations.

While several behavioral scientists have proposed power typologies, the most popular and widely accepted taxonomy is French and Raven's (1959) five bases of power: reward power, coercive power, legitimate power, referent power, and expert power. Several extensive field studies on these power bases have been accomplished (and are reviewed in Chapter II); however, the focus of this study: the balance of power in a matrix organization, presents new opportunities for knowledge. One significant outcome of this study will be an attempt to

eliminate the numerous methodological problems discovered (and discussed in Chapter II) in the field studies on power.

Specific Problem

Although a great deal has been written about power, very little is actually known about this elusive construct. This knowledge gap on power is confounded by the methodological problems in field studies attempting to close the gap. In addition, there has been no research investigating the relationships between the sources of power of the functional and project managers, how that power is distributed within the matrixed organization, and the relative effectiveness of these managers. There are interesting areas remaining to be studied. For example: Are each of the bases of power independent of one another? Given the wide variety of power bases available to the project/functional manager, which type of power should be emphasized in order to maximize effectiveness? Will these differ between the project and functional manager? What are the effects of combining the various sources of power? What are the effects of the bases of power on each other?

In an attempt to answer these questions, the present study will specifically examine the relationships between the project and functional managers' sources of power, the overall distribution of power in the organization, and the effectiveness of the project and functional managers found in matrixed SPOs in the Air Force Systems Command.

Investigative Questions and Hypotheses

As will be discussed in the literature review, many of the previous studies of social power used a rank-ordering scheme to determine the effect of each base for social power. Such a forced choice format necessarily leads to a correlation between the use of one social power with use of another. However, if the original theoretical statements of French and Raven (1959) are examined, only once is the interaction between bases addressed (i.e., providing rewards may increase referent). Thus,

Investigative Question #1: Are the five bases of power, as theoretically described by French and Raven, orthogonal and distinct measures of social influence?

Hypothesis 1.1: A project manager's use of each of the five bases of power will be independent of the other power bases.

Hypothesis 1.2: A functional manager's use of each of the five bases of power will be independent of the other power bases.

Personnel management is more complex in matrix organizations than in conventional forms of management because project managers have to deal effectively with a variety of interfaces and support personnel over whom they have little or no formal authority, while functional managers must work in an environment where their managerial power is shared with the program managers. If project managers lack position power (reward, coercive, and legitimate) over SPO personnel, this may necessitate more reliance on personality, persuasive ability and

negotiation (re: expert and referent power) to influence team members. This dichotomous use of power in a matrix organization raises the interesting question of which side of the matrix has more influence over group members. The review of the relevant literature strongly suggests there is a lack of empirical results versus personal speculation about the dynamics of power in a matrix organization. Thus, this study will attempt to empirically answer the question,

Investigative Question #2: In a matrixed SPO, what is the power spectrum and overall balance of power among project and functional managers as perceived by SPO personnel?

Hypothesis 2.1: A functional manager will be perceived as using more reward power than a project manager.

Hypothesis 2.2: A functional manager will be perceived as using more coercive power than a project manager.

Hypothesis 2.3: A functional manager will be perceived as using more legitimate power than a project manager.

Hypothesis 2.4: A project manager will be perceived as using more expert power than a functional manager.

Hypothesis 2.5: A project manager will be perceived as using more referent power than a functional manager.

Because of the lack of prior work concerning the overall balance of power issue for matrix management, a rather speculative hypothesis is offered.

Hypothesis 2.6: A functional manager will be perceived as having more overall power than their project manager counterparts.

Within the matrix organization, the project manager's role is one of integrator and coordinator of tasks. Project managers must cross functional lines to get the required support. Almost invariably the project manager must build multi-disciplinary teams into cohesive groups and deal successfully with a variety of interfaces. In contrast to functional managers who are provided power largely in the form of legitimate authority, project managers must derive their power mostly from other sources. Organizational behavior suggest (although it has not been empirically tested) that project managers should use personal forms of power (expert and referent), whereas functional managers should use their position power (reward, coercive, and legitimate) to effectively build an environment conducive to their subordinates motivational needs. Thus,

Investigative Question #3: What are the independent effects perceived by subordinates within a matrixed SPO of each of the five bases of power on the project and functional manager's overall power and managerial effectiveness?

Hypothesis 3.1: Each of the project manager's sources of power is highly related to his overall power.

Hypothesis 3.2: Each of the functional manager's sources of power is highly related to his overall power.

Hypothesis 3.3: A project manager perceived as using expert power will receive higher subordinate evaluations than a functional manager perceived as using expert power.

Hypothesis 3.4: A project manager perceived as using referent power will receive higher subordinate evaluations than a functional manager perceived as using referent power.

Hypothesis 3.5: A functional manager perceived as using reward power will receive higher subordinate evaluations than a project manager perceived as using reward power.

Hypothesis 3.6: A functional manager perceived as using coercive power will receive higher subordinate evaluations than a project manager perceived as using coercive power.

Hypothesis 3.7: A functional manager perceived as using legitimate power will receive higher subordinate evaluations than a project manager perceived as using legitimate power.

Hypothesis 3.8: A project manager's expert and referent powers are more highly related to leader effectiveness than his or her reward, coercive, or legitimate powers.

Hypothesis 3.9: A functional manager's reward, coercive, and legitimate powers are more highly related to leader effectiveness than either his/her referent or expert power.

French and Raven theorized that sources of power are additive in that each new source adds to a person's accumulated power. However, it is possible that sources are not combined additively to generate an

individual's cumulative power (e.g., expert power may not help someone who has strong referent power). On the other hand, some combinations of power may be synergistic, in that they create disproportionate increase in total power (e.g., someone in a position of authority may be able to capitalize on personal charisma in a way that would be impossible without the position). Thus,

Investigative Question #4: Because power can come from several sources, what are the results of combining sources?

Hypothesis 4.1: A project manager's combination of expert and referent powers are more highly related to managerial effectiveness than either of these sources of power alone.

Hypothesis 4.2: A functional manager's combination of legitimate, reward, and coercive powers are more highly related to managerial effectiveness than either of these sources of power used alone or in pairs.

Summary

This study will attempt to bridge the gap between the lack of empirical results versus opinion and personal speculation about the dynamics of power in a matrix organization. The literature abounds with reports of problems in implementing the matrix system, conflicts between functional and project managers, and stories of success and failure with the matrix structure. However, there are very few systematic studies of the perceptions of people who are actually matrixed or involved on project teams. By studying the perceptions

that SPO personnel have about a project manager versus a functional superior, we will gain more knowledge regarding this two-boss system that is unique to matrix management. In addition, there are at least two other reasons to measure power and influence from the viewpoint of the targets of influence: First, people do not necessarily react to objective facts but rather to their individual perceptions about those facts. Second, a substantial amount of research indicates that considerable discrepancy often exists between what managers do and what they say they do.

The first part of this research is concerned with developing psychometrically sound measures of the French and Raven power bases. In particular, this study will attempt to eliminate the numerous methodological problems inherent in the field studies of power. The second part of this study focuses on determining whether French and Raven's theoretical power constructs are truly independent of one another as they suggest. Finally, this study examines the relationships between the project and functional managers' sources of power, the overall distribution of power in the SPO environment, and the effectiveness of these two managers as perceived by their subordinates. Chapter II provides a review of the current literature and a rationale of why a departure from previous methodologies is needed in order to properly examine French and Raven's five bases of power.

II. Literature Review

Introduction

In essence, only two kinds of investigations have been performed in the vast majority of research studies. One type focuses on the covariation between measures of different constructs. Relationships between independent and dependent variables are the focus of such investigations. This sort of research is called substantive (Nagle, 1953; Nunnally, 1978; Schwab, 1981). However, substantive research constitutes only one part of the research process. An equally important set of research issues involves the relationship between the results obtained from measures and the concepts or constructs the measures are purported to assess. These studies are called construct validation research (Northrup, 1959; Nunnally, 1978).

Even a cursory glance through the organizational behavior literature reveals that there has been an imbalance between substantive research relative to construct validation research. As a consequence, knowledge of substantive relationships is perhaps not as great as is often believed, and (more speculatively) not as great as would be true if the idea of construct validity received greater attention. While many researchers took great care in reporting the results of their efforts, they were not equally careful in reporting the limitations of their measuring instruments. Thus, it seems quite clear that

investigators must sequence their research activities so that construct validity is considered before research is performed.

The concern for construct validity before substantive research is especially relevant for the power and social influence studies. Almost without exception, the literature on power contains research accomplished with measures that have marginal validity and reliability. This situation raises questions concerning the extent of our understanding about the sources of power.

This chapter discusses the literature on power and focuses on the methodological problems discovered in the field studies of social power. The first section reviews the definitional distinctions between power, influence, and authority. The definitional review is followed by a description of the various sources or bases of social power. Next, findings from field studies of power are reviewed and summarized. Methodological problems discovered in these field studies are then examined, followed by a section on the implications of these problems for this study. The final section looks at some conceptual issues that were not addressed in any of the empirical studies of power.

Power, Influence, and Authority

Even though power has been a focus of analysis since antiquity (Dahl, 1957), it is still far from completely understood. Review articles on power, and related concepts such as influence and authority, have appeared with some regularity. Table 1 presents in chronological order some authors' comments on the status of power

Table 1

Power - The State of the Art

Robert Bierstedt, 1950

In the entire lexicon of sociological concepts none is more troublesome than the concept of power. We may say about it in general only what St. Augustine said about time, that we know perfectly well what it is -- until someone asks us (Bierstedt, 1950:730).

Robert Dahl, 1957

There are students of the subject . . . who think that . . . the whole study of "power" is a bottomless swamp. . . . [!] It is probably too early to know whether these critics are right (Dahl, 1957:201).

William Riker, 1964

We are still not at all sure of what we are talking about when we use the term [power] (Riker, 1964:341).

Allan Kornberg and Simon Perry, 1966

There are almost as many definitions of power as there are theorists writing on the subject (Kornberg and Perry, 1966:53).

William Pollard and Terence Mitchel, 1972

There a number of conceptualizations of social power that differ in emphasis and in scope, and the relationship of these different views to each other is not clear (Pollard and Mitchel, 1972:433).

James Tedeschi, 1972

The current status of theory and research in the areas of social power and influence is clearly inadequate from almost anybody's point of view. Hypotheses are ambiguously stated, research programs continually end up in cul-de-sacs, and experiments take on the character of isolated one-shot studies (Tedeschi, 1972:vii).

Andrew Pettigrew, 1973

There are as many different definitions of the concept of authority and power as there are of the concept of role (Pettigrew, 1973:24).

knowledge. These assessments of "the state of the art" on power studies reveal little agreement on what is actually known about power.

Review of Power Definitions

One of the main contributors to a knowledge gap about power is the considerable confusion among writers over its definition. Power, influence, and authority are often definitionally indistinct among scholars. These definitional problems and their endurance over time are likely a reflection of the complexity of the topic. Without some agreement on what is being investigated, it is not surprising that there is "an anarchy of concepts and empirical data" (Tedeschi and Bonoma, 1972:1).

Definitions of power vary in their consideration of the use of force. Many treat power as an imposition of will -- an overcoming of resistance to get others to do something they would not do otherwise (Etzioni, 1968; Mechanic, 1962; Minton, 1972; Weber, 1947; Weber, 1964). Other approaches are even more sinister, focusing on the use of coercion to attain one's ends (Fried, 1967; Lasswell and Kaplan, 1950; Stotland, 1959).

Definitions also vary in the extent to which they restrict power to interpersonal relationships (Cartwright, 1959) as opposed to influence over processes (Kanter, 1977). That is, many approaches view power as something a specific person (or group) does to another specific person (or group). Other approaches include a person's power over things or processes.

Another definitional bone of contention is the usefulness of examining "potential" power. A number of authors view power primarily in terms of its effects (Dahl, 1957; Harsanyi, 1962; Russell, 1938; Simon, 1957). In this approach, what matters is not how much power one nominally has, or even that one uses the power, but that power is demonstrated only when one actor actively and deliberately gains compliance from another.

There are numerous other differences among definitions, including their degree of formality, specificity, empirical support, and general acceptance. Each way of conceptualizing power has strengths and weaknesses and leads to different hypotheses. Unfortunately, there is no simple way to resolve the differences, and attempting to do so has already generated more heat than light. Perrow argued that "a simple, consistent meaning of power, or decomposition of the concept into various types, might be preferable, but I doubt it" (Perrow, 1970:84). However, for clarity of communication and as a guide for discussion it is necessary to settle on one definition of power.

For the purposes of this study, it will be accepted that while there are many ways to define power, a broad definition of power will allow consideration of more research evidence and will preserve more of the organizational complexity of power than will a narrow definition. An analysis of the various power definitions reveals that three general approaches have been used: power as a property of the individual, power as a result of an interpersonal relationship, or power as a

result of the organizational structure. Together, these three approaches suggest a working definition of power.

Property of the Individual. Early views of power from political science and sociology treated the concept as an individual's ability, or perceived ability, to influence others (Etzioni, 1961), or to change the behavior of others (Dahl, 1957; Weber, 1947). These definitions implicitly treat power as a personality trait (McClelland, 1975) or as an acquired skill.

Property of Interpersonal Relationships. An alternative definition holds that a person only has power with respect to other individuals in specific relationships (Pfeffer, 1981). Psychologists have viewed power as an aspect of interaction (Cartwright, 1959; Dansereau et al., 1975; Yukl, 1981; Yukl, 1989a). This perspective focuses on dyadic processes and perceptions rather than on the qualities of one person.

Property of the Organization. Mechanic (1962) argued that power results from access to and control over persons, information, and resources, which comes from the individual's position in the organization. Power has also been treated as the capacity to affect outcomes or goals in organizations (Mintzberg, 1983; Salancik and Pfeffer, 1974; Salancik and Pfeffer, 1977) and as a structural phenomenon created by the division of labor (Pfeffer, 1981).

Power Defined. By combining each of these approaches, a working definition of power can be suggested. Power is an influence by one person over others, stemming from a position in an organization,

from an interpersonal relationship, and from an individual characteristic.

Power can be categorized as objective or perceived (Kaplowitz, 1978). A person can have objective control over organizational resources or rewards, which may or may not be perceived by self or others. The distinction is important and will be maintained in this study, because attributional biases may lead individuals to perceive some superiors as having more or less power than they actually have.

Definition of Influence and Authority

Some writers have equated power with influence. Tautologies have been endemic. Observations that A leads B have lead to the conclusion that A has more power than B. However, inferences about power and its effects must begin with measures of power that are completely independent of observed relations between A and B. The observed relations are a product of the power differences between A and B, not the behavior observed (Bass, 1981).

Influence is a function of power. It is defined as the use of power resulting in a change in the probability that a person or group will adopt the desired behavioral change (Hersey and Blanchard, 1982). Authority is a particular type of power which has its origin in the position that a person occupies. Thus, authority is the power that is legitimized by virtue of an individual's formal role in a social organization.

Sources of Power

It is desirable to distinguish between different sources of power, because the required conditions vary somewhat, as do the consequences associated with use of each source of power. Several behavioral scientists have proposed power typologies (Cartwright, 1965; Dahl, 1957; Etzioni, 1961; French and Raven, 1959; Lee, 1977; Patchen, 1974; Peabody, 1962; Weber, 1975), but the most popular and widely accepted is the five-fold typology developed by French and Raven some thirty years ago. The five bases of power proposed by French and Raven are defined in Table 2. These five sources of power are inherent in the organization, in interpersonal relationships, and in the characteristics of the individual. This distinction parallels the proposed definition of power and the domains of analysis used in this study.

Position power. A primary source of power in an organization or other social system is derived from position power (Etzioni, 1961), which is integral to the individual's formal role. It includes control over resources, rewards and punishments, information, work environment, and work procedures. Of the five basis of power proposed by French and Raven, three concern the position in the organization: Reward and coercive power stem from having the resources to reward and punish others; legitimate power is based on formal authority.

Interpersonal Relationships. One source of power in a dyadic relationship is personal power, or informal power based on expertise, attractiveness, and charisma (Yukl, 1981). It involves influence

Table 2

French and Raven Power Taxonomy
(Adapted from Yukl, 1981:35)

Reward Power	The target person complies in order to obtain rewards he or she believes are controlled by the agent.
Coercive Power	The target person complies in order to avoid punishments he or she believes are controlled by the agent.
Legitimate Power	The target person complies because he or she believes the agent has the right to make the request and the target person has the obligation to comply.
Expert Power	The target person complies because he or she believes that the agent has special knowledge about the best way to do something.
Referent Power	The target person complies because he or she admires or identifies with the agent and wants to gain the agent's approval.

through rational persuasion, faith, and personal identification. This type of power seems to gain importance at higher levels in the organizational hierarchy (Pfeffer, 1981). This personal power corresponds with French and Raven's referent power, which is based on identification.

Interpersonal sources of power can be described in terms of the direction of influence. In a superior-subordinate dyad, power is traditionally seen as flowing downward, with the superior exerting the influence. An alternative view pictures power as reciprocal, with the subordinate exerting upward influence (Mechanic, 1962; Yukl, 1981). Similarly, lateral or horizontal power involves influence over peers. Downward power may depend upon the individual's upward and lateral power (Burke, 1986; House et al., 1971) and upon subordinates' upward power. Upward, downward, and lateral power may be seen as combining to influence an individual's total personal power.

Individual Sources of Power. Sources of power independent of the job concern individual disposition and skills. A personal quality related to power is expert power, which is based on a person's perceived knowledge and expertise. Expert power is based partly upon perceptions, including self-perceptions. Expertise may be critical for the development of interpersonal power and for the effective use of organizational power.

Informational and Legal Sources of Power. Conceptually, there have been attempts to expand the French and Raven typology to include so-called "informational" and "legalistic" power sources (Brown et al.,

1983; Kasulis and Spekman, 1980; Lusch and Brown, 1982). However, these alleged power sources appear to be already captured by the French and Raven framework. The degree to which information is accepted by a recipient would surely depend on the perceived expertness of the information provider. If this information is favorably regarded or positively valued by the recipient, it would constitute a reward. Likewise, if a person recognizes that an arrangement is such that there is a legal basis for another's authority, this would represent the legitimate power source. The capacity to take legal action or impose legal sanctions, which presumably would be regarded unfavorably by the target person, would be a manifestation of the coercive power source. In other words, legal sanction could be perceived as a punishment.

Review of Power Studies

Even though the French and Raven classification system was not derived from empirical research, it motivated a number of analysts to try to answer the following question: Given the wide variety of power bases available to the leader, which type of power should be emphasized in order to maximize effectiveness (where effectiveness is a function of both performance and satisfaction)? Over the past twenty years, there have been a number of studies that attempted to investigate the relationship between work group effectiveness and the degree to which a leader utilizes various power bases. Relevant results from these field studies are summarized in Table 3.

TABLE 3
RESULTS OF FIELD STUDIES RELATING BASES OF SOCIAL POWER TO VARIOUS SUBORDINATE CRITERION VARIABLES

Study	Sample	Scale Used	Criterion Variables	Results and/or Rank of Importance					
				Reward	Coercive	Legitimate	Expert	Referent	
Bachman et al. (1966)	656 Salespeople from 36 branch officers of a company selling intangibles	Bachman et al.'s 1-item Scales (Ranked)	Office Level						
			Performance	-.55**	-.31	-.17	.36**	.40**	
			Managerial Satisfaction	-.51**	-.71**	-.57**	.69**	.75**	
			"Isolated" Office Level						
			Performance	-.12**	-.09**	-.08	.13**	.09*	
			Managerial Satisfaction	-.16**	-.19**	-.24**	.17**	.22**	

Rank of Importance									
Bachman (1968)	685 full-time faculty members from 12 Liberal Arts Colleges	Bachman et al.'s 1-item Scales (Ranked)	College Level						
			Dean's Power						
			Job Satisfaction	-.61*	-.57	-.27	.56	.57	
			Dean Satisfaction	-.80**	.70**	-.52	.75**	.67*	
			Individual Level						
			Dean's Power	-.09*	-.06	-.06	.05	.08	
			Job Satisfaction	-.31**	-.20**	-.18**	.18**	.22**	
			Dean Satisfaction						

Rank of Importance (Dean's Power)									
College Level Faculty Power									
			Job Satisfaction	-.75**	-.24	.42	.61*	.11	
			Dean Satisfaction	-.75**	-.71**	.47	.62*	.39	
Individual Level Faculty Power									
			Job Satisfaction	.10	-.03	.09	.08	.00	
			Dean Satisfaction	-.26**	-.22**	.20**	.22**	.10*	

Rank of Importance (Faculty Power)									
			Job Satisfaction						
			Dean Satisfaction						

TABLE 3 (continued)

Study	Sample	Scale Used	Criterion Variables	Results and/or Rank of Importance				
				Reward	Coercive	Legitimate	Expert Referent	
Bachman (1968) (Cont.)	860 insurance agents from 40 regional insurance offices	Bachman et al.'s 1-item Scales (Likert)	Performance	.54**	.03	.26	.48**	-.19
			Supervisory satisfaction	.48**	-.52**	.04	.88**	.43*
Bachman (1968)	180 semiskilled utility workers in 21 work groups	Bachman et al.'s 1-item Scales (Ranked)	Overall Satisfaction	-.12	-.23	-.35	.30	.11
	Student 486 Hourly Employees and 39 First-line Supervisors	Student's 1-item Scales (Ranked)	Accidents	-.03	-.16	-.20	.28*	-.12
Student 486 Hourly Employees and 39 First-line Supervisors	From a Manufacturer of Major Home Appliances		Excused Absences	-.18	.16	-.12	.28*	-.35*
			Unexcused absences	.18	.02	-.08	.02	-.02
			Turnover	.14	.08	.01	.01	.23
			Indirect Cost Performance	.15	.22	.00	.10	.40**
			Maintenance Cost Performance	-.20	-.30*	.10	.18	.00
			Supply Cost Performance	.31*	.08	.08	.32*	.21
			Scrap Cos. Performance	.26	.12	.06	.13	.33*
			Performance vs. Schedule	-.06	.04	-.05	.21	-.05
			Quality	.13	-.08	.11	.31*	.32*
			Average Earnings	-.40*	-.22	.05	.01	.00
			Suggestions Submitted	.09	.40**	.10	.14	.36*
			Rank of Importance			3	5	1

TABLE 3 (continued)

Study	Sample	Scale Used	Criterion Variables	Results and/or Rank of Importance							
				Reward	Coercive	Legitimate	Expert	Referent			
Ivan- cevic (1970)	224 life insur- ance agents from 34 agencies	Student's 1-item Scales (Ranked)	Agency Level								
			Status satisfaction	.39**	-.21	-.12	.69**	.72*			
			Autonomy satisfaction	.28**	-.10	-.38**	.63*	.71*			
			Growth satisfaction	.32**	.11	.17	.72*	.68*			
Rank of Importance				4	5	1	2	3			
Ivan- vich & Donnelly (1970)	394 salesmen from 31 sales branches of a food products firm	Modified Bachman et al's 1-item Scales (Ranked)	Excused absences	-.19	-.04	-.16	-.29*	-.29*			
			Unexcused absences	.10	.11	.04	-.14	-.22*			
			Turnover	-.07	.02	.06	.04	.01			
			Market potential ratio	-.09	.14	.11	.21*	.25*			
			# and size of orders	.11	.08	.07	-.02	.19			
			Efficiency rating	.23*	-.12	-.16	.16	.21*			
			Direct selling costs	-.04	.19	.13	.22*	.10			
			Route density factor	.12	.18	.01	.09	.31*			
			Rank of Importance				3	5	2	1	4
			Slocum (1970)	96 professional and scientific employees in a Pennsylvania steel mill	Combined Bachman et al. & Student's 1-item Scales (Ranked)	Cosmopolitans (N = 35)					
Performance	-.52*	-.31*				.07	.57*	.30*			
Job satisfaction	.04	-.34*				.19	.41**	-.21			
Freedom satisfaction	.17	-.23				.03	.32*	-.12			
Supervisory satisfaction	.02	-.08				-.37*	.45**	.30*			
Organization satisfaction	.14	-.10				-.02	-.08	.07			
Pay satisfaction	.13	.06				-.01	-.08	-.09			
Rank of Importance						4	5	2	1	3	

TABLE 3 (continued)

Study	Sample	Scale Used	Criterion Variables	Results and/or Rank of Importance					
				Reward	Coercive	Legitimate	Expert	Referent	
Slocum (1970) (cont.)			Locals (N = 61)						
			Performance	-.41**	-.23*	.12	.22*	.23*	
			Job satisfaction	.12	-.31**	.13	.20	.15	
			Freedom satisfaction	.07	-.08	.13	.20*	.15	
			Supervisory satisfaction	-.04	.01	-.32**	.36**	.24*	
			Organization satisfaction	.04	-.01	.14	.19	-.13	
			Pay satisfaction	.15	.11	.01	.09	.17	
			4	5	2	1	3		

Cope (1972)	71 full-time faculty members	Bachman et al.'s 1-item Scales (Ranked)	Cosmopolitans (N = 34)						
			Job satisfaction	-.10	-.36*	.11	.33*	.01	
			Locals (N = 37)						
			Job satisfaction	-.16	-.18	.41*	.13	.29	

Thamhain & Gemmill (1974)	22 project managers and 66 project personnel in a large electronics company	Thamhain & Gemmill's 1-item Scales (Ranked)	Degree of support	-.20	-.45**	-.10	.15	.00	
			Willingness to disagree	-.10	.00	-.20	.30*	.00	
			Project involvement	-.15	.00	-.35**	.00	.00	
			Performance rating	-.15	-.02	-.30*	.40**	.17	
			3	5	1	2	4		

TABLE 3 (continued)

Study	Sample	Scale Used	Criterion Variables	Results and/or Rank of Importance						
				Reward	Coercive	Legitimate	Expert	Referent		
Jamieson & Thomas (1974)	207 students from 3 school levels--High school, Under-graduate & Graduate	Modified Student's 1-item Scales (Ranked)	H.S. Teacher Power (N = 100)							
			Satisfaction with education	n.s.	-.17*	n.s.	n.s.	n.s.		
			Satisfaction with teacher	n.s.	-.16	n.s.	n.s.	n.s.		
			Rank of Importance	5	2	1	3	4		

			Undergrad Teacher Power (N = 57)							
			Satisfaction with education	n.s.	-.27*	n.s.	n.s.	n.s.		
			Satisfaction with teacher	n.s.	-.32**	n.s.	n.s.	n.s.		
			Rank of Importance	4	1	2	3	5		

Dunne et al. (1978)	49 project personnel working in SPOs in the Air Force	Modified Thamhain & Gemmill's 1-item Scales (Ranked)	Graduate Teacher Power (N = 40)							
			Satisfaction with education	n.s.	-.32*	n.s.	n.s.	n.s.		
			Satisfaction with teacher	n.s.	-.35*	n.s.	n.s.	n.s.		
			Rank of Importance	3	4	2	1	5		

			Program Manager							
			Degree of support	-.04	-.15	.18	.63**	.26		
			Willingness to disagree	.10	.06	.00	.28**	.15		
			Work involvement	.13	-.16	.07	.18	.06		
			Job Satisfaction	.00	-.09	.05	.21	.29*		
Rank of Importance	5	4	3	1	2					

TABLE 3 (continued)

Study	Sample	Scale Used	Criterion Variables	Results and/or Rank of Importance				
				Reward	Coercive	Legitimate	Expert	Referent
Dunne <i>et al.</i> (1978) (cont.)	Functional Manager		Degree of support	-.15	-.11	.03	.43**	.20
			Willingness to disagree	.20	-.01	-.14	.20	.16
			Work involvement	.08	.10	.06	.25	.01
			Job satisfaction	-.05	-.19	-.14	.32*	.10
	Rank of Importance		3	5	1	2	4	
Sheridan & Vreden- burgh (1978)	216 nurses and nurses' aids <i>et al.</i> 's 1-item Scales (Forced choice)		Job tension	-.12	.34**	.11	-.21**	-.09
			Performance	-.09	-.24**	.02	.12	.17*
			Terminations	-.01	.12	.01	-.04	-.08
Busch (1980)	415 salesmen from three pharmaceutical companies	Modified Bachman <i>et al.</i> 's 1-item Scales (Likert)	Company 1 (N = 159)					
			Supervisory satisfaction	.03	-.22**	.08	.69**	.58**
			Company 2 (N = 128)					
			Supervisory satisfaction	-.01	-.03	-.05	.46**	.24**
	Company 3 (N = 128)							
	Supervisory satisfaction		.22**	-.21**	.25*	.58**	.45**	

TABLE 3 (continued)

Study	Sample	Scale Used	Criterion Variables	Results and/or Rank of Importance				
				Reward	Coercive	Legitimate	Expert Referent	
Martin & Hunt (1980)	239 construction and 80 design personnel in a midwestern state highway department	Student's 1-item Scales (Likert)	Construction bureau	.10	-.11	.01	.19*	.16*
			Job satisfaction	.04	.13	-.06	-.09	-.08
			Intent to leave					
			Design bureau					
			Job satisfaction	.01	-.04	.18*	.36*	-.03
			Intent to leave	.11	.11	-.13	.14	-.03

* p < .05

** p < .01

n.s. = not significant

Unfortunately, interpretation of the findings from these field studies is limited by some serious methodological problems in the research. Yukl summarized a similar set of studies using the French and Raven typology presented in Table 3 and concluded that "the use of reward power and leader effectiveness is inconsistent with the findings of some other research on leadership and motivation" (Yukl, 1981:40). Yukl also pointed out that the results of these power studies may be limited due to potential attributional biases in the influence measures (Yukl, 1981:39). These problems, plus more serious ones, will be discussed at length following a review of the power study findings. One of the objectives of this study will be to develop an improved technique for the measurement and assessment of the effects of social power.

Findings of the Power Studies.

1. Bachman et al. (1966) obtained data from thirty-six branch offices of a national sales organization. Each office was managed by a single office supervisor. Employees were asked to rank each of the five power bases according to the extent to which it was a reason for compliance. These results were then correlated with satisfaction and performance measures. Respondents were also asked to rank order each power base using importance as a criteria. As shown in Table 3, legitimate and expert power emerged as numbers 1 and 2 in importance, followed by referent, reward and coercive power. In those offices in which referent and expert power predominated, performance and

satisfaction were high. In those offices in which reward power was high, performance tended to be poor and there was marked dissatisfaction. Coercive and legitimate bases of power were associated with dissatisfaction, but they were unrelated to performance. Note that the calculated correlations between power bases and satisfaction and performance measures do not correspond to the reported rank-orders. This situation might be indicative of the influence of attribution bias referenced by Yukl (1981). The discussion of Ivancevich (1970) suggests a similar situation.

2. Bachman et al. (1968) was a comparative study of three organizations. They examined twelve liberal arts colleges, forty agencies of a life insurance company, and twenty-one work groups of a large Midwestern utility company. A ranking procedure was used to ascertain the strength of the supervisors' power base in the colleges and the utility company, while an independent rating procedure for each power base was used with the life insurance agencies. Expert and legitimate power were again the most important reasons for complying with superiors in all three organizations. Expert power was most important and legitimate power second in the colleges and insurance agencies, while the order was reversed for the utility company. Expert and referent power were again strongly and positively related to satisfaction in these three organizations, while reward and legitimate power were not strongly related to the satisfaction measures. Coercive power was consistently related to dissatisfaction. Performance data

were obtained from the insurance agencies, but not from the colleges or utility company. Expert and reward power were positively related to insurance agency performance measures, while the other power bases yielded nonsignificant correlations.

3. Student (1968) studied forty production groups in two plants of a company manufacturing home appliances. Employees rated the extent to which they comply with their foreman due to each of the five French and Raven power bases. Legitimate power was found to be the strongest reason for compliance, followed by expert, reward, referent, and last coercive power. Student also related the foreman's power base utilization (as perceived by the workers) to a number of measures of performance. He found that legitimate power, while most important among the reasons for compliance, was not related to the performance of work groups. Reward and coercive power were positively related to some performance measures (suggestions submitted, supply cost performance) but negatively related to others (average earnings, maintenance cost performance). Expert and referent power were significantly and positively related to four and five measures of performance, and thus emerged as the most effective base of supervisory power. Student explains these results by suggesting that expert and referent power are qualitatively different from legitimate, reward, and coercive power. Expert and referent power were considered idiosyncratic in character and dependent on an individual's unique role behavior, while legitimate, reward, and coercive power are organizationally determined and designed

to be equal for supervisors at the same hierarchical level. Implicit in Student's conclusions is the contention that subordinates are responsive to and satisfied with a leader whose influence attempts are not based entirely on position-based power.

4. Ivancevich (1970) conducted a study of leader power bases and three categories of satisfaction in 34 life insurance agencies. While legitimate power was ranked first among the reasons for compliance with the agency manager's directives, the correlations shown in Table 3 show that legitimate power is only related significantly to autonomy satisfaction. Expert power was ranked second among reasons for compliance.

5. Ivancevich and Donnelly (1970) studied salesmen's perceptions of their managers' power bases in thirty one branches of a large firm that produces food products. The employees were asked to rank the power bases in order of importance for compliance. As shown in Table 3, expert power was most important, followed by legitimate, reward, referent, and coercive power. Referent and expert power were positively related to performance, while reward, legitimate, and coercive power showed no relationship.

6. Slocum (1970) examined the relationship between management's control of "cosmopolitan" and "local" scientific and professional employees in a steel mill against employee satisfaction and performance. "Cosmopolitans" were defined as those employees who look

for recognition from within their professional association as opposed to "locals" who prefer organizational rewards in lieu of professional recognition (Slocum, 1970:485). Slocum found that the most important reasons for complying with organizational supervisors were legitimate and expert power. Cosmopolitans complied to a greater extent than locals with their immediate supervisor because of his expert knowledge in the field. Expert power was also the most consistent difference between local and cosmopolitans in relation to performance. Referent power was also positively related to performance. Expert and referent power also provided the strongest and most consistent correlations with employee satisfaction.

7. Cope (1972) studied chairmen power bases and faculty member satisfaction in six social science departments. Like Slocum, he divided the employees into cosmopolitans and locals. Cope found that locals perceived and favored referent and legitimate power, while cosmopolitans placed more emphasis on the use of rewards and expert power.

8. Thamhain and Gemmill (1974) examined the relationships between influence methods of project managers and their project performance in a large electronics company. They found that while legitimate and expert power were cited by project personnel as the most important reasons for compliance with project managers, the reports were not consistent with calculated correlations. Project managers who were perceived to emphasize expert power achieved higher project performance

ratings, but at the cost of greater disagreement and involvement among project personnel. Conversely, use of legitimate power resulted in lower project performance but also less disagreement and involvement among project personnel (Thamhain & Gemmill, 1974:222).

9. Jamieson and Thomas (1974) conducted a study of power in the classroom. Data were collected from high school, undergraduate, and graduate students on their teachers' bases of power and results were correlated with several measures of student satisfaction. For the high school students, legitimate power was most important, followed by coercive, referent and reward power. The undergraduate students viewed coercive power as most important, followed by legitimate, expert, reward, and referent. The graduate students perceived expert power as the strongest, followed by legitimate, reward, coercive, and referent power. Coercive power was strongly and negatively associated with satisfaction among all three groups, while the other four power bases yielded insignificant results.

10. Dunne et al. (1978), using similar measures as Thamhain and Gemmill (1974), studied 10 project managers and 49 project personnel in military system program offices. As shown in table 3, Dunne et al. found that while project personnel perceive differences in strength and ranking of project and functional manager power sources, only referent power for project managers and expert power for functional managers were significant with job satisfaction.

11. Sheridan and Vredenburg (1978) looked at head nurses' perceived bases of power and staff members' job performance. They found that only the use of referent power by the head nurse was positively and significant associated with performance while use of coercive power was significantly negatively associated with performance.

12. Busch (1980) analyzed the relationship between sales manager's social power bases and the salesperson's satisfaction with supervision in three pharmaceutical companies. Busch found that the most consistently positive and the strongest correlations were the sales managers' expert and referent power.

13. Martin and Hunt (1980) studied the job satisfaction of construction and design personnel in a midwestern state highway department and their perceptions of the supervisor's bases of power. Expert power was positively and significantly correlated for both the construction and design bureaus. In addition, referent power was significant in the construction bureau.

Summary of findings

It is interesting to note that since the Martin and Hunt power study in 1980, no other field study using the complete French and Raven typology could be found in the literature. This may be a result of the fact that despite some twenty years of empirical studies, there were, and still are, no clear generalizable results. While expert and

legitimate power bases appear to be the most important reasons for subordinate compliance, and expert and referent power bases tend to be strongly and consistently related to subordinate performance and satisfaction measures, the results suggest that the appropriate power is largely affected by situational variables. In other words, leaders may need or use various power bases, depending on the situation. However, these conclusions are highly speculative since all of the power studies have methodological problems that threaten validity. These problems will now be discussed in detail.

Methodological Problems in the Power Studies

As noted earlier, some researchers take great care in reporting the results of their studies but neglect to point out the limitations of their measuring instruments. This is partly because the process of instrument development is complex and time consuming. Investigators such as Kerlinger noted more than fifteen years ago, however, that there "is a growing understanding that all measuring instruments must be critically and empirically examined for their reliability and validity" (Kerlinger, 1973:473).

While the field studies of social power appear to yield fairly consistent findings, there are several methodological limitations with these studies that make drawing firm conclusions highly questionable. These methodological problems include poor operationalizations of each of the French and Raven power bases, use of one-item measurement scales, potential response biases, inappropriate scale formats, and

lack of power base independence. These deficiencies are analyzed below.

Poor Operationalizations

The three published instruments that are currently available for measuring French and Raven bases of power were developed by Bachman et al. (1966), Student (1968), and Thamhain and Gemmill (1974). These three instruments (or slight modifications of them) have been used in the majority of the field studies. However, the popularity of the instruments is surprising in view of the lack of evidence for their psychometric adequacy. The many studies that have used the instruments provide some evidence of criterion-related validity. However, this is by no means adequate for respectable survey instruments.

All three instruments use a single item to measure each of the bases of power. But when these instruments are compared to French and Raven's original theoretical definitions, it is quite evident that these single items have poor content and face validation. The inadequacy of the content validity is due to the failure of the instruments' designers to provide an adequate sample of the kind of behavior or attribute that relate to each of the power bases. In addition, at least one of the scales of the instruments has poor face validity because it is not apparent what it is trying to measure "on the face of it". The French and Raven theoretical definitions of the bases of power will now be directly compared with the instruments used in the field studies on power.

Reward Power. French and Raven defined reward power as:

. . . power whose basis is the ability to reward. The strength of the reward power of O/P increases with the magnitude of the rewards which P perceives that O can mediate for him. Reward power depends on O's ability to administer positive valences and to remove or decrease negative valences. The strength of reward power also depends upon the probability that O can mediate the reward, as perceived by P. (French and Raven, 1959:156)

Thus, reward power is based on P's perception that O can reward him for desired behavior. O could use pay raises, promotions, bonuses, or recognition to exert reward power over P. Most of the field studies on power used one of the three following items to measure reward power:

1. "He can give special help and benefits to those who cooperate with him" (Bachman et al., 1966:130).
2. "I comply with my supervisor's directives because he can give special help and benefits to those who cooperate with him" (Student, 1968:190).
3. "I feel he can influence my salary" (Thamhain and Gemmill, 1974:218).

The items of the reward power scales encourage guesswork on the part of the subjects regarding the specific ways O can give them special help and benefits (e.g., pay raise, promotion, bonus, etc.). French and Raven suggested that reward power will be effective if it is considered legitimate by P. The scales of Bachman et al. (1966) and Student (1968) imply that rewards are generally used by O in a quasi-legitimate manner to obtain P's compliance with his requests. Additionally, all three reward power scales use very narrow conceptualizations of rewards. Bachman et al. (1966) and Student (1968) measure only help and benefits while Thamhain and Gemmill (1974)

assessed only salary. Therefore, it seems unlikely that any of these items fully operationalize the content domain of reward power.

Bachman et al. (1966) recognized the potential problems with their reward power scale in their initial article. They noted that:

The negative relationship between the use of reward power and our measures of effectiveness requires further explanation. We stated earlier that reward power might be associated with supportive or ego-enhancing practices of management . . . However, it may be that many employees are ambivalent about the use of reward power by their supervisor. It may be well to reward someone for a job well done, but rewards may also be perceived as bribes, pay-offs, favoritism and the like. The phrase used in the present study, "He can give special help and benefits to those who cooperate with him" may have implied the latter type of reward. (Bachman et al., 1966:135)

Unfortunately, no attempt was made in subsequent studies (including two more by Bachman) to correct the deficiency.

Coercive Power. French and Raven conceptualized the coercive power construct as being:

. . . similar to reward power in that it also involves O's ability to manipulate the attainment of valences. Coercive power of O/P stems from the expectation on the part of P that he will be punished by O if he fails to conform to the influence attempt. Thus, negative valences will exist in given regions of P's life space, corresponding to the threatened punishment by O. The strength of coercive power depends on the magnitude of the negative valence of the threatened punishment multiplied by the perceived probability that P can avoid the punishment by conformity (i.e., the probability of punishment for nonconformity minus the probability of punishment for conformity). (French and Raven, 1959:157)

Coercive power is based on P's perception that O has the ability to punish him if he fails to conform to the influence attempt. Firing, suspending, demoting, or reprimanding are possible ways of using

coercive power. Coercive power was measured in most of the field studies by one of the following items:

1. "He can apply pressure or penalize those who do not cooperate" (Bachman et al., 1966:130).
2. "I comply with my supervisor's directives because he can penalize or make things difficult for those who do not cooperate with him" (Student, 1968:190).
3. "I feel he can apply pressure or penalize me in some way" (Thamhain and Gemmill, 1974:219).

The items of the coercive power scales also encourage guesswork on the part of the subjects regarding the specific ways in which O can penalize, make things difficult, or apply pressure (e.g., fire, suspend, demote, etc.) to achieve compliance. Moreover, it is not clear whether these items were designed to measure a legitimate or illegitimate base of coercive power. This encourages some interpretation of the items by the subjects. In this example, as with the reward power scales, the coercive power scales represent a very narrow operationalization of the broad French and Raven conceptualization.

Legitimate Power. As defined by French and Raven, legitimate power of O/P is:

. . . that power which stems from internalized values in P which dictate that O has a legitimate right to influence P and that P has an obligation to accept this influence. We note that legitimate power is very similar to the notion of legitimacy of authority which has long been explored by sociologists . . . However, legitimate power is not always a role relation: P may accept an induction from O simply because he previously promised to help O, and he values his word too much to break the promise. In all cases, the notion of legitimacy involves some sort of code or standard,

accepted by the individual, by virtue of which the external agent can assert his power. (French and Raven, 1959:159)

Thus, legitimate power involves more than just position power or authority. However, each of the three field instruments of legitimate power use a more restrictive item content as shown below.

1. "He has a legitimate right, considering his position, to expect that his suggestions will be carried out" (Bachman et al., 1966:130).
2. "I comply with my supervisor's directives because he has a right, considering his position, to expect subordinates to do what he wants" (Student, 1968:190).
3. "I feel he has the formal authority" (Thamhain and Gemmill, 1974:218).

Again, these three items indicate that legitimate power was narrowly operationalized as position power.

Referent Power. French and Raven noted that:

The referent power of O/P has its basis in the identification of P with O. By identification, we mean a feeling of oneness of P with O, or a desire for such an identity. If O is a person toward whom P is highly attracted, P will have a desire to become closely associated with O. If O is an attractive group, P will have a feeling of membership or desire to join. If P is already closely associated with O, he will want to maintain this relationship. P's identification with O can be established or maintained if P behaves, believes, and perceives as O does . . . to influence P, even though P may be unaware of this referent power. The stronger the identification of P with O the greater the referent power of O/P. (French and Raven, 1959:161-162).

French and Raven's definition of referent power suggest that a key item of this power base is an identification or feeling of oneness of P with O. The following items were used to measure referent power in the field studies:

1. "I admire him for his personal qualities, and want to act in a way that merits his respect and admiration" (Bachman et al., 1966:130).
2. "I comply with my supervisor's directives because he is a 'nice guy' and I don't want to hurt him" (Student, 1968:190).
3. "He has established a personal friendship with me" (Thamhain and Gemmill, 1974:219).

While the measures of Student (1968) and Thamhain and Gemmill (1974) suggest that P likes or is friendly with O, they do not appear to capture the same intensity of identification as suggested by French and Raven. Additionally, Student's scale in particular has poor face validity; it simply does not measure identification or the feeling of oneness of P with O.

Expert Power. French and Raven postulated that "the expert power of O/P varies with the extent of the knowledge that P attributes to O within a given area. Probably P evaluates O's expertness in relation to personal knowledge as well as against an absolute standard" (French and Raven, 1959:267). Thus, expert power is based on P's belief that O has adequate professional experience, training, special expertise, and access to knowledge. The following items have been used to measure this power base:

1. "I respect his competence and good judgment about things with which he is more experienced than I" (Bachman et al., 1966:130).
2. "I comply with my supervisor's directives because I respect his experience and good judgment" (Student, 1968:190).
3. "I respect him and place confidence in his special knowledge and advice" (Thamhain and Gemmill, 1974:219).

These items take into account only experience, competence, or judgment in measuring expert power. Other sources such as training, special expertise, and access to knowledge must also be taken into account. Thus, like the other power base measures, these scales are a very narrow operationalization of a broad concept.

Summary of Power Base Operationalizations.

The first problem with the field studies of power concerns the content validity of the various scales used to operationalize French and Raven's bases of power. Virtually every item represents a very narrow operationalization of what are theoretically broad concepts, and several items on some of the scales seem to imply extraneous content or are unnecessarily vague and open to different interpretations by different respondents. This situation raises the question of whether these studies speak directly to the French and Raven conceptualizations. Improved measurement is clearly needed if anything is to be said with confidence about the impact of the five power bases on subordinate outcome variables.

Scale Reliability

A second and related problem with the social power scales is that the majority are composed of one item each. There are three measurement difficulties associated with single-item measures (Nunnally, 1978:66-67). First, individual items usually have considerable uniqueness or specificity in that each item tends to have only a low correlation with the attribute being measured and tends to

relate to other attributes as well. Second, single items tend to categorize people into a relatively small number of groups. For example, a five-step rating scale can at most distinguish between five levels of an attribute. Third, individual items typically have considerable measurement error; they produce generally unreliable responses in the sense that the same scale position is unlikely to be checked in successive administrations of an instrument.

All three of these measurement difficulties can be diminished with multi-item measures: (1) the specificity of items can be averaged out when they are combined, (2) by combining items, relatively fine distinctions can be made among people, and (3) the reliability tends to increase and measurement error decreases as the number of items in a combination increases (Nunnally, 1978:67).

The folly of using single-item measures is illustrated by a question posed by Jacoby:

How comfortable would we feel having our intelligence assessed on the basis of our response to a single question? Yet that's exactly what we do in research. . . . Given the complexity of our subject matter, what makes us think we can use responses to single items (or even to two or three items) as measures of these concepts, then relate these scores to a host of other variables, arrive at conclusions based on such investigation, and get away calling what we have done "quality research"? (Jacoby, 1978:93)

Another problem with single-item scales is that it is not possible to assess the internal consistency reliability. Schwab (1981:15-17) noted that estimates of internal consistency are a necessary prerequisite for establishing the empirical construct validity of a measure. Additionally, Nunnally (1978) noted that a lack of

reliability in measurement may obscure relations between variables. Thus, the use of one-item scales may have lessened the relations that were reported between the five measures of social power and the various subordinate criterion variables. The last thirty years of research with the French and Raven power constructs (as measured with the current single-item scales) may have been wasted effort.

Finally, eleven of the fifteen statements in the three instruments contain double-barreled phrases that reduce the reliability of the scales. For example, "He (my superior) can apply pressure or penalize those who do not cooperate" (Bachman *et al.*, 1966) is such a statement. It is quite likely that some superiors can apply pressure on their subordinates but are unlikely to penalize them for noncooperation. The items should have been split into single-idea items (Churchill, 1979:68).

Thus, it seems quite clear that multiple-item scales must be developed for each of the French and Raven power bases to arrive at more reliable and relevant empirical results.

Response Bias Potential

Another problem with the measures used in the field studies of social power is the possibility of social desirability or attribution biasness of the scales (Yukl, 1981). The scales commonly used attributional referents (e.g., "Why did you comply?") rather than behavioral referents (e.g., "How does your superior act?"). Yukl notes that "it is more acceptable for subordinates to attribute their

compliance to the leader's expert or referent power than to acknowledge they have been influenced by desire for material rewards or fear of punishment" (Yukl, 1981:36). Thus, the measures of reward and coercive power may be underestimated, especially for satisfied subordinates. To alleviate this response bias in surveys and questionnaires on power, behaviorally anchored questions must be used.

Scale Format Effects

A fourth problem is that many of the previous studies used a rank-ordering scheme to determine the effects of each base of social power. Such a forced choice format necessarily leads to a correlation between the use of one social power with use of another. This problem was acknowledged by Bachman et al. (1966):

Some caution must be exercised in interpreting correlations with the bases of power. The ranking method used in obtaining the data makes it impossible [underline added] for all five bases of power to be correlated in the same direction with any single criterion variable. Thus, it may be that positive correlations with expert and referent power are responsible for negative correlations with the other bases of power. (Bachman et al., 1966:133)

It is surprising that despite similar cautions from other researchers (Alderfer, 1972; Bachman, 1968; Bachman et al., 1968; Beer, 1966) there continues to be reports of rank-order comparisons among power bases.

Power Base Independence

In general, no attempts have been made in the field studies to determine the independent contribution of each power base on subordinate criterion variables. Bass (1981), Yukl (1981), and Shetty

(1978) noted that many of the bases of power may not be perceived as totally independent of each other and, may, in fact, be related. Bass noted:

Personal power sources like referent and expert are likely to be correlated empirically, that is, lodged in the same people. In the same way, the position holder with power to reward is also likely to have the power to punish. The position will give some degree of legitimacy as well. By definition, formal hierarchies are a structure of legitimate, reward, and coercive power relationships. (Bass, 1981:178)

Similarly, a leader who possesses referent power may also be seen as possessing expert power, because people are attracted to the leader and attribute expertise to those individuals they like. As a result of these and other possible interdependencies, it is impossible to draw any conclusions about the independent effects of each of the five power bases, because none of the field studies attempted to partial out the effects of any of the other power bases when one particular power base was under examination. This simply means that all of the obtained research results reported to date may be confounded by interdependencies among the five power bases. It is conceivable that nothing is known about the independent effects of each individual source of power.

Implications for this study

Over the past few decades, French and Raven's conceptualization of social power has played a major role in the literature of social and industrial psychology. Despite this, however, it is probably fair to say that given the methodological problems in most field studies of power, our knowledge about relations between the bases of social power

and subordinate criterion variables is far from complete. Before such knowledge can be acquired, several improvements in research in this area are necessary.

First, more adequate measures of the French and Raven power bases must be developed. Much of the existing research on the bases of social power has been undertaken without much apparent concern for either the validity or reliability of the measures that were used. The use of single-item scales with questionable content validity and scaling procedures has severely limited the understanding of the relations between the bases of social power and subordinate criterion variables.

Second, the use of the ranking procedure to assess the bases of social power should be avoided. The use of this scaling procedure tends to force negative correlations to occur between some of the measures of power and subordinate criterion variables. This problem can be avoided through the use of Likert-type scales to measure social power.

Third, and related to the previous two points, future scales used to measure French and Raven's bases of power should use behaviorally anchored items rather than attributionally based references. This would reduce potential for confounding scales by social desirability and attributional biases.

Fourth, the independent contribution of each of the power bases to the variance explained in subordinate criterion variable needs to be analyzed.

Other Conceptual Issues

Related Power Studies in Marketing Channels. It is curious to note how seldom the organizational behavior scholars investigating interorganizational phenomena reference the relatively lengthy stream of conceptual and empirical work focusing on marketing channels. There have been several vertical marketing system studies that have investigated the ways in which power can be used to specify roles, increase satisfaction and performance, and manage conflict within given institutional structures. These investigations permit the drawing of normative implications for the design, implementation, and maintenance of viable interorganizational networks. Of particular importance to this study (and the reason why the marketing channel power literature is being reviewed), is the consistency of the definition of power used in the marketing channel empirical studies, and the relationships between power and the bases of power. Outside of the marketing literature, it seems that no research effort has examined these important relationships.

In the study of marketing channels as interorganizational systems, researchers found it useful to conceive of marketing channels as "superorganizations." This term implies that channels have the characteristics of complex social organizations (Weick, 1965), even though channels are comprised of collectivities rather than individuals. Viewing interorganizational relationships as a superorganization corresponds to what organizational theorists have

referred to as a social action system (Aldrich, 1979; Van de Ven, 1976).

The essential content of this definition of a marketing channel as a superorganization or as a social action system is that the channel exhibits the basic elements of any organized form of collective behavior. Thus, within marketing channels, there are:

- a. activities among members that are aimed at attaining both collective and self-interest goals;
- b. a division of functions and tasks resulting in interdependent processes; and
- c. integrated actions taking place that result in channels developing a unique identity separate from its members (Van de Ven, 1976).

The varying degrees of interdependencies among channel members give rise to power relations between the organizations comprising the channel (Beier and Sterns, 1969; Cadotte and Sterns, 1979; El-Ansary, 1972; Etgar, 1976; Heskett et al., 1970; Hunt and Nevin, 1974). A main purpose of recent channel research has been to demonstrate how a study of power relationships in marketing channels may provide useful insights into channel functioning and interorganizational interactions. Most of the studies of marketing channels have dealt with the presence, use, and consequences of power (El-Ansary, 1972; El-Ansary, 1975; El-Ansary and Stern, 1972; Etgar, 1976a; Etgar, 1976b; Hunt and Nevin, 1974; Palamountain, 1955; Wilemon, 1972; Wilkinson, 1973; Wilkinson,

1974; Wilkinson and Kipnis, 1978), both in symmetrical and asymmetrical vertical power relationships.

Although power has been defined in a variety of ways in the social psychology and organizational behavior literatures, power has been consistently defined in the marketing channels context as one firm's ability to influence the perceptions, behavior, and/or decision making of members of another firm (El-Ansary and Stern, 1972; El-Ansary, 1972; Wilkinson, 1974; Hunt and Nevin, 1974). The basis for this definition rests with Weber (1947), who defined power as the probability that a person can carry out his or her own will despite resistance, and Emerson (1962), who states, "The power of actor A over actor B is the amount of resistance on the part of B which can be potentially overcome by A" (Emerson, 1962:32). This definitional consistency has allowed many marketing channel studies to build on one another and advance the "state of the art" of what is known about power in a marketing system.

In addition, the marketing power studies have empirically assessed the relationships between power and the sources of power. However, in contrast to the organizational behavior power studies reviewed previously, marketing researchers have had difficulty in empirically differentiating the various sources of power. Most studies have resorted to dichotomizing the various power sources into coercive and noncoercive sources. The most commonly offered rationale for doing this is that coercive power can be differentiated from the other others because it alone involves potential punishment (Gaski, 1984; Hunt and Nevin, 1974). For all the other noncoercive sources of power (reward,

legitimate, expert, and referent), the individual willingly rather than begrudgingly yields power to another. Thus, in the marketing power studies, the following power model is proposed:

$$P_{ij} = f(C_{ij}, N_{ij})$$

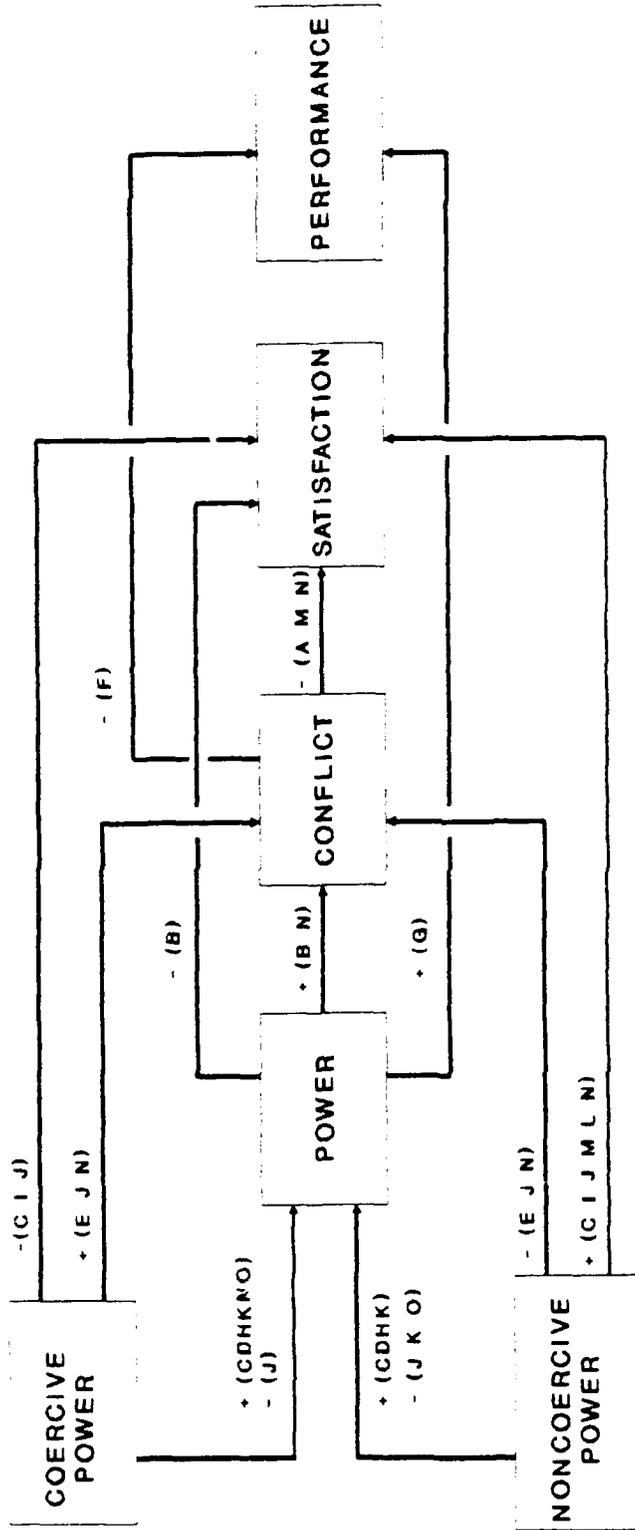
where:

P_{ij} = power of channel member i over member j,

C_{ij} = coercive power of i over j, i.e., power based on the anticipation of the part of j of possible punishment by i if he fails to yield to the influence attempt, and

N_{ij} = noncoercive power of i over j, i.e., power that j willingly yields to i because j believes that: (1) i has the ability to mediate rewards for him; (2) i has a legitimate right to prescribe behavior for him; (3) he has an identification with i; or (4) has some special knowledge or expertise in a given area.

Gaski (1984) reviewed a number of the marketing power studies and developed an integrated overview of the status of the theory of power and conflict in marketing channels. He compiled the research findings and constructed a model of the relationships among power, conflict, and selected other variables based entirely on empirical evidence. An adapted version of this model is depicted in Figure 1. It must be noted, however, that this model reflects an uncritical review of the research studies and accepts the validity of all measures and conclusions. Like the organizational behavior power studies reviewed previously, the marketing studies also exhibit several methodological problems (i.e., insufficient operationalizations of variables, unreliable measures, single-item constructs, etc.). However, Gaski's



- | | | |
|-------------------------------|-----------------------------|---------------------------|
| A. Rosenberg and Stern (1971) | G. Etgar (1976a) | M. Dwyer (1980) |
| B. Walker (1972) | H. Etgar (1976b) | N. Wilkinson (1981) |
| C. Hunt and Nevin (1974) | I. Lusch (1977) | O. Lusch and Brown (1982) |
| D. Wilkinson (1974) | J. Brown and Frazier (1978) | |
| E. Lusch (1976a) | K. Etgar (1978) | |
| F. Lusch (1976b) | L. Michie (1978) | |
- LEGEND
- + = Positive Relationship
- = Inverse Relationship

Figure 1. Composite Model of Marketing Channel Power Relationships (adapted from Gaski, 1984)

model does provide some interesting relationships between power and the bases of power and can be used to develop some preliminary hypotheses (compare with Hypotheses 3.1 and 3.2.). This model could also serve as the initial starting point for future empirical tests of the displayed subordinate criterion variable relationships once adequate psychometric scales for French and Raven's bases of power are developed.

Combinations of Sources of Power. Because power can come from several sources, a critical question concerns the result of combining sources. This issue has seldom been addressed in theories of power. French and Raven theorized that the sources of power are additive in that each new source adds to a person's accumulated power. However, it is possible that the sources of power are not combined additively to generate an individual's cumulative power (e.g., expert power may not help someone who has strong referent power). On the other hand, some combinations of power may be synergistic, in that they create disproportionate increases in total power (e.g., someone in a position of authority may be able to capitalize on personal charisma in a way that would be impossible without the position). Michener and Burt (1975) found that compliance of group members was greater when the leader had both coercive and legitimate power. Bass (1981), summarizing research on interactive coercive and legitimate power effects, noted that "legitimacy coupled with coercion will increase the public and private acceptance of coercive demands" (Bass, 1981:184). Similar joint effects might be expected between a number of the French and Raven bases of power.

Thus, there appears to be a need to use partial correlation or multiple regression in studies of social power to assess the joint effects of various combinations of power sources.

Power Base Effects on Each Other. A final issue that has not been addressed in any empirical studies is the effect of the various power sources on each other. One reason for the importance of this question is that the impact of power sources on various criterion variables may be more complex than has been considered empirically. In other words, each power source may affect power, satisfaction, performance, etc., not only directly but also through the intermediation of its effects on other sources of power. For example, though the direct impact of reward power on satisfaction may be positive, if it acts to decrease other power sources (perhaps by reducing the perception of expertness or legitimacy) its net effect may be weakened or even negative. As an illustration, a functional manager that grants rewards beyond a reasonable level may appear foolish to program office personnel and hence less expert. Similarly, the use of coercion clearly could reduce one's likeability, or referent power.

Thus, there is a need to examine the causal interrelationships among the French and Raven power sources. However, since causality is virtually impossible to infer from a cross-sectional field study, this study will have to serve only as a starting point for future longitudinal efforts investigating this rich field of research.

Summary and Applications

A review of the literature shows that organizational behavior has suffered because investigators have not accorded construct validity the same deference as substantive validity. As a consequence, substantive conclusions may have been generated without warrant. This concern for construct validity before substantive research is especially relevant for studies on power and social influence. Many researchers have not been careful in reporting the limitations of their measuring instruments. An important result of this discovery was to sequence this study so that construct validity (Chapters III and IV) was considered before substantive research was performed (Chapter V).

The literature review on power reveals little agreement on what is actually known about this elusive concept. The main contributor to a knowledge gap about power is the lack of a consistent power definition. Researchers have differed in defining power in the consideration of the use of force, interpersonal relationships, potential versus actual power, degree of formality, empirical support, and general acceptance. In preserving more of the organizational complexity of power, power is defined in this study as an influence by one person over others, stemming from a position in an organization, from an interpersonal relationship, and from an individual characteristic.

While several classifications of leader or supervisory power have been set forth, the bases of power taxonomy suggested by French and Raven (1959) still appears to be fairly representative and popular in

application. The power bases identified by French and Raven are reward, coercive, legitimate, expert, and referent.

A review of the field studies on power using the French and Raven power classification system suggest that leaders may need or use various power bases, depending on the situation. The appropriate power source is largely affected by situational variables. However, these conclusions are highly speculative since all of the power studies have methodological problems that threaten validity and reliability.

The methodological problems discovered in the field studies of power include poor operationalizations of the French and Raven power bases, inappropriate scale formats, potential response biases, and lack of power base independence. Several improvements in research were suggested before knowledge about power could be gained. These improvements include the development of more accurate measures of the French and Raven power bases to include multiple-item measuring scales. In addition, Likert-type scales were suggested as improvements over the preponderance of ranking procedures used in the field studies. This scaling procedure tends to force negative correlations between some of the measures of power and subordinate criterion variables. Third, future scales should use behaviorally anchored items rather than attributionally based references in measuring the bases of power. This would reduce the potential for social desirability and attributional biasness on the part of the respondents. Finally, the independent contribution of each of the power bases on subordinate criterion variable needs to be analyzed.

One area of study where power has been defined consistently is in marketing channel studies. This definitional consistency has allowed marketing channel investigators to build on one another and advance the "state of the art" of what is known about power in a marketing system. In addition, there has been much research examining the relationships between power and the bases of power. However, in contrast to the organizational behavior power studies, marketing researchers have had difficulty in empirically differentiating the various sources of power. Most studies have resulted in dichotomizing the various power sources into coercive (coercive power) and noncoercive (reward, legitimate, expert, and referent power) sources. Gaski (1984) developed a model that integrated the various research findings of the status of power in marketing channels. This model was depicted in Figure 1 (page 54) and was used to develop some preliminary hypotheses on power for this study.

An issue that has seldom been addressed in theories of power concerns the question of whether the various sources of power are combined additively to generate an individual's cumulative power. One objective of this study is to look at the various joint effects of combining a number of the French and Raven power bases in project and functional managers.

III. Methodology

Introduction

This chapter outlines the research design and research methodology used in this study. The first section provides information regarding the research design selected. Next, the data collection method employed is detailed. The data collection discussion is followed by a description of the development of a Managerial Power Index. This instrument contains factorially independent subscales for measuring French and Raven's (1959) five bases of leader power: coercive, reward, legitimate, expert, and referent. The following two sections describe the development of a perceived managerial effectiveness instrument and a managerial influence instrument. Next, the three phase pilot study is addressed followed by a description of the sample population. The research assumptions are then reported along with a final section summarizing the methodological objectives of this study.

This research effort is basically a cross-sectional field study employing data from a sample of project personnel working in matrixed system program offices (SPOs). The unit of analysis in the present study is the individual of a project team who works for both a functional and project manager. The empirical setting selected was matrixed Air Force SPOs located at Wright-Patterson Air Force Base.

Research Design

The present research is designed as a cross-sectional field study employing data from a sample of matrixed project personnel working in Air Force SPOs. According to Kerlinger, field studies are "any scientific studies, large or small, that systematically pursue relations and test hypotheses, that are ex post facto, and that are done in life situations" (Kerlinger, 1973:405). The ex post facto condition distinguishes this research approach from experiments in the laboratory or the field. By conducting ex post facto research, we are in a position where we have no direct control over independent variables because their manifestations have already occurred or they are inherently not manipulable.

The selection of a field study over a laboratory or field experiment partly follows from intuition as to the best approach in the present situation. First, the realism of field research should be obvious. Indeed, it is the field with its socially significant "real life" issues we are interested in, not the laboratory with its artificial experimental research situations. Furthermore, field studies are expected to enhance the external validity of the findings (Cook and Campbell, 1979). Secondly, the variance of variables in field studies is typically large. Increased variability tends to produce relatively strong differences between independent and dependent variables, and thus enhances the statistical conclusion validity of the results (e.g., Cook and Campbell, 1979). In contrast, the effects of experimental manipulations in experimental settings are usually weak

(Kerlinger, 1973). Thus, a nonexperimental paradigm is preferred to an experimental research paradigm in the present situation.

It is worth noting that French and Raven's theory of power has been tested in experimental settings as well as in the field settings that were discussed in Chapter II. Most of this research was conducted in the early 1960s and has been expertly summarized by Schopler (1965). Schopler's (1965) review of the experimental studies found that: coercive power induced greater resistance than reward power; users of reward power were more popular than those who relied on coercive power; conformity to coercive power increased with the strength of the potential punishment; conformity increased as the legitimacy of the punishing act increased; and expert performance on one task increased the ability of the expert to exert influence on co-workers involved in a second task. Taken together, these studies provided evidence for French and Raven's (1959) taxonomy of power theory. However, due to methodological dictates, early researchers only examined two bases of power at any one time. In an effort to overcome this limitation and to examine the full impact of the five bases of power, later researchers used field settings almost exclusively (beginning with Bachman et al. in 1966). Since the present study is designed to test the full range of French and Raven's (1959) theory of power, field research is most applicable.

This study is cross-sectional in that it is based on a sample of matrixed project personnel across different SPOs and job positions. This approach is definitely a threat to the internal validity of the

results but is, however, thought to contribute to increased external validity.

An integral part of the research design is the research strategy (Kerlinger, 1973). The strategy describes the steps to be carried out and the methods to be used to gather and analyze the data. Table 4 summarizes the research strategy of this study.

Data Collection Method

Data were gathered for this project using a mail survey. A mail survey was selected because surveys permit data to be gathered from a large number of responses and because they are economical in terms of both time and money (Emory, 1985). As discussed earlier in Chapter II, questions used in previous field studies of power have questionable validity and reliability. Thus, a significant portion of this study was to develop measures of power with good psychometrics. This instrument development process is described in the next section. The survey was approved for distribution by the Air Force Military Personnel Center on 15 June 1989 and assigned control number USAF SCN 89-56. Appendix A is a complete copy of the survey instrument.

Instrument Development

While there are no absolute set of rules that specify the steps to take in developing valid multi-item measures of constructs, Churchill (1979) provided an excellent description of a paradigm designed to improve construct development. This paradigm was originally intended

Table 4

Research Strategy

<u>Research Decision/Activity</u>	<u>Decision Criteria/Focus</u>
o The selection of power as the topic of study	o Personal interest
o The methodological decision to do a cross-sectional field study	o Realism; effect size; external validity
o The choice of matrixed SPOs as the empirical setting of the study	o Personal knowledge; convenience; representativeness; generalizability (theory application); sample homogeneity
o Construct operationalization; design of the data collection instrument	o Actual French & Raven definitions; self-reported measures; self-administered questionnaire
o Empirical analysis of research data	o Methodological objectives; interval scales; construct validity; reliabilities; factor analysis; multiple regression; correlational analysis
o Limitations; future research	o Theoretical, managerial, methodological implications; evaluations; suggestions

to improve construct development in the field of marketing, but it appears equally applicable to other content domains as well.

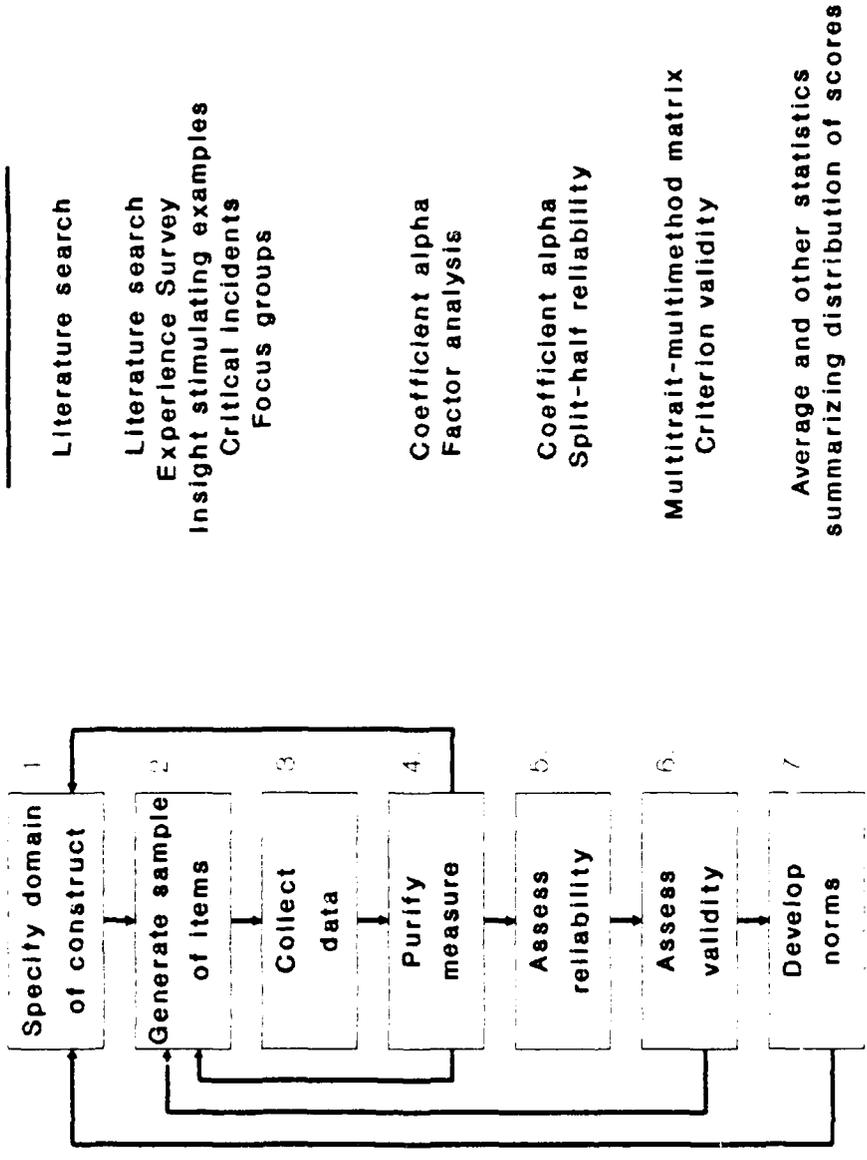
Figure 2 is Churchill's proposed diagram of the sequence of procedures and a list of some calculations that should be performed in developing better measures of constructs. This type of sequence has worked well in several instances and produced measures with desirable psychometric properties (Churchill et al, 1974; Ruekert and Churchill, 1984). The same procedure will now be used to develop better measures of French and Raven's bases of power.

Measurements of French and Raven's bases of power.

1. Specify domain of construct. The first steps in developing better measures are to define the constructs conceptually and then specify their domains. In Chapter II, it was shown that previous organizational theorists and industrial psychologists used very narrow conceptualizations of each of the bases of power. Building on the French and Raven original theoretical definitions and the analysis in Chapter II of previous operationalizations, the following definitions of each of the sources of power are proposed:

a. Reward power involves promising some positive outcomes to motivate changes in behavior; it is based on having access to commodities that others value. It is the perceived ability to administer to another person things that person desires or to remove or decrease things that person does not desire.

**Recommended Coefficients
or Techniques**



Literature search

Literature search
Experience Survey
Insight stimulating examples
Critical Incidents
Focus groups

Coefficient alpha
Factor analysis

Coefficient alpha
Split-half reliability

Multitrait-multimethod matrix
Criterion validity

Average and other statistics
summarizing distribution of scores

Figure 2. Procedure for Developing Better Measures
(adapted from Churchill, 1979)

b. Coercive power involves threatening to deliver aversive outcomes and punishment to force a subordinate to change their behavior; as in the case of reward power, it is based on access to resources that increase the strength and credibility of the threat. It is the perceived ability to administer to another person things that person does not desire, or to remove or decrease the things that person desires.

c. Legitimate power is authority derived from being in a particular organizational role or position, which induces an obligation based on the norms that subordinates should obey the orders of a superior. It is the perceived ability to administer to another person feelings of obligations or responsibility.

d. Referent power is based on a subordinate's desire to identify with and be similar to a liked and esteemed supervisor. It is the perceived ability to administer to another person feelings of personal acceptance or approval.

e. Expert power is based on the subordinate attributing some greater knowledge to the influencing agent, on the faith that the superior knows what is the best thing to do in that particular situation. It is the perceived ability to administer to another person information, knowledge, or expertise.

2. Generate sample of items. The second step in the procedure for developing better measures is to generate items which capture the domain as specified. According to Churchill "the literature should indicate how the variable has been defined previously and how many

dimensions or components it has" (Churchill, 1979:67). However, as described in Chapter II, a content analysis of French and Raven's theoretical discussions of the bases of power does not provide many obvious behavioral referents. Reward and coercive power are defined in terms of resources available to the influencer, i.e., "reward power is defined as power whose basis is the ability to reward" (French and Raven, 1959:156) and coercive power is "similar to reward power in that it also involves O's ability to manipulate the attainment of valences" (French and Raven, 1959:157). Referent power is said to have "its basis in the identification of P (target) with O (influencer) -- a feeling of oneness of P with O, or a desire for such an identity" (French and Raven, 1959:161). Thus, referent power is described not in terms of the resources of the influencer but in terms of the characteristics and motivations of the target. Similarly, legitimate power is defined in terms of the target person's characteristics and motivations, i.e., "as that power which stems from internalized values in P which dictate that O has a legitimate right to influence P and P has an obligation to accept the influence" (French and Raven, 1959:159). Finally, expert power is discussed in terms which in part depend on certain characteristics of the influencer (e.g., his credibility) and in part on certain resources he possesses (e.g., facts). It appears, then, that the five bases of power distinguished by French and Raven are not described in a conceptually parallel way. Instead, for different types of power, different aspects of the process underlying successful influence are highlighted.

Thus, in constructing behaviorally anchored measurement items, the following points were used as a guide:

(1) Reward and coercive power items refer to outcomes of importance to the member that the leader may deliver or withhold;

(2) Referent and legitimate power items refer to behaviors that may meet motives internalized by the member;

(3) Expert power items refer to skills, training or knowledge the leader is believed to possess; and

(4) Attempts were made to write items of varying valence as well as to vary the probability that the superior could directly control the outcome involved (e.g., immediate verbal praise versus a promised future promotion).

Thus, having conceptually defined each of the bases of power and noting that French and Raven did not discuss each power base in a conceptually similar way, the following items are proposed to describe the relevant behavior for each of the power bases:

a. Reward Power will be measured by the following items:

1. My Project/Functional Manager recommended me for a promotion each time I was qualified.
2. My Project/Functional Manager personally pays me a compliment when/if I do outstanding work.
3. My Project/Functional Manager rewards me with desirable job assignments.

4. When/if I do outstanding work, my Project/Functional Manager rewards me with high performance ratings or tells the person who writes my performance evaluation.

5. My Project/Functional Manager recommends me for awards or commendations when my work is consistently above average.

6. My Project/Functional Manager makes sure I get rewarded with time off when my work performance is especially good.

b. Coercive Power will be measured by the following items:

1. My Project/Functional Manager takes disciplinary action or reprimands me when/if my work is below standard.

2. My Project/Functional Manager gives me undesirable job assignments when/if I don't cooperate with him or her.

3. My Project/Functional Manager is critical of my work even when I perform well.

4. My Project/Functional Manager makes me work overtime when I don't meet established task deadlines.

5. My Project/Functional Manager gives me extra work punishment when/if I don't comply with his or her orders.

6. My Project/Functional Manager gives me low performance ratings when/if I work below acceptable standards or tells the person who writes my performance evaluation.

7. My Project/Functional Manager chews me out when I perform badly.

c. Legitimate Power will be measured by the following items:

1. My Project/Functional Manager exercises a lot of authority over I how I perform my job.

2. My Project/Functional Manager expects me to follow his or her requests since we are both on the same team and thus working toward the same goal.

3. My Project/Functional Manager expects his or her recommendations will be carried out since (s)he is the senior manager on my team.

4. My Project/Functional Manager lets me know (s)he has the right to expect my cooperation because (s)he outranks me.

5. My Project/Functional Manager tells me what to do because (s)he has the authority to do so.

6. My Project/Functional Manager expects me to follow his or her orders because (s)he has information that I don't have and thus a good reason for issuing any order.

d. Expert Power will be measured by the following items:

1. My Project/Functional Manager provides me with sound job-related advise.
2. My Project/Functional Manager gets me to accomplish the work by demonstrating that (s)he knows how to perform the task.
3. My Project/Functional Manager makes on the spot corrections.
4. My Project/Functional Manager impresses me with his or her overall competence and ability.
5. My Project/Functional Manager shares his or her experience and/or training with me.
6. My Project/Functional Manager does not know what (s)he is doing.

e. Referent Power will be measured by the following items:

1. My Project/Functional Manager relies on our good relations with one another to get the job done.
2. My Project/Functional Manager makes me feel like (s)he approves of me as a person.
3. My Project/Functional Manager sets the example and relies upon me to follow his or her example.

4. My Project/Functional Manager makes me feel valued.
5. My Project/Functional Manager relies on me to get the job done because I don't want to let him or her down.
6. My Project/Functional Manager relies on our friendship in getting me to do the job.

Responses will be scored from 1 for "never" to 7 for "always." Obviously, this approach operationalizes the variables in terms of frequency, ignoring any possible intensity or instrumentality dimensions. It will be used for two reasons: (1) to lighten the task-completion burden on respondents (especially considering the length of the survey instrument) and (2) because of the contribution the specification of such dimensions have made in other multiattribute model research (Bruno and Wildt, 1975; Mazis et al., 1975).

Steps 3 through 7 of Churchill's Model (Figure 2) are contingent upon actual data. These steps will be addressed in Chapter IV where the topic of construct validation is addressed.

Perceived Manager Effectiveness Measure.

A perceived managerial effectiveness instrument was also developed for this study. The measurement of specific manager behaviors is problematic for a study on power because an important aspect of effective management is the ability to influence. An instrument based

on specific manager behaviors would therefore result in either having similar items for the dependent and independent variables, or omitting important influence-related items in the dependent variable.

One solution to this problem is the use of global items to measure a manager's effectiveness (e.g., "My Project/Functional Manager is one of the best managers in my SPO.") This solution would be optimal if the global items could be shown as representing the specific behaviorally based items. In Ragins (1988) power and gender congruency study of male and female managers, she assessed the relationship between five global items and 46 behaviorally based items of managerial effectiveness. She found strong correlations between the specific and global items, coupled with high coefficient alpha for all 51 items. These results provided adequate support for using the five global items as a managerial effectiveness instrument. Modifying Ragins' (1988) instrument for this study, the initial five items used for measuring a manager's effectiveness are:

1. My Project/Functional Manger is an effective manager.
2. My Project/Functional Manger displays effective managerial behaviors.
3. My Project/Functional Manager displays strong managerial abilities.
4. My Project/Functional Manager is one of the best managers I have ever had.

5. My Project/Functional Manager is one of the best managers in my SPO.

All five items will be based on a six-point Likert scale ranging from strongly disagree (1) to strongly agree (6). It was decided to not have a "neither agree nor disagree" response in order to prevent respondents from giving essentially a no opinion answer.

Perceived Managerial Power Instrument.

An instrument was also developed for this study to measure the perceived power of the project and functional managers. Managerial influence will be initially measured with a scale designed to capture a subordinate's perception of a manager's potential influence over his job in seven different areas: technical details of project work, future work assignments, appraisal ratings, technical quality of project work, salary and/promotions, work hours, and task deadlines. These areas of influence were culled from previous field research on project and matrix management (Leclaire, 1977; Melhart, 1976; Moyer, 1974; Peterson, 1986; Tesch, 1970; Tsukamoto, 1973; Vasconcellos, 1979; Vasconcellos and Hemsley, 1981)

This type of perceptually based interpretation and operationalization of power has considerable support (Friedrich, 1941; Lippitt et al., 1952; March 1969; Raven, 1965; Simon, 1953; Tedeschi and Bonoma, 1972; Thibaut and Kelly, 1959). The potential weakness of this power measurement approach is a possible tendency to elicit socially acceptable responses -- project personnel may be unwilling to admit the

amount of managerial influence they perceive. However, this bias may be offset by a desire to ingratiate oneself with the manager by reporting high willingness to yield.

Respondents will be asked to indicate the extent to which their project/functional manager influences the above seven areas of their jobs using a scale from 1 "not at all" to 7 "to a very great extent." In addition to rating each of the managers separately, respondents will also be tasked to compare the overall influence between the project and functional managers. The seven job areas will be rated again, but this time using a scale from 1 "My Project Manager dominates" to 7 "My Functional Manager dominates."

Pilot Study

In preparing the questionnaire for application in this study, a three phase pilot study was conducted to establish preliminary content validity. Particular emphasis during the pilot study was placed on the items used to measure the five bases of power. In the first phase, the questionnaire was critiqued by six management and psychology professors of the Air Force Institute of Technology. Those items which were reported to be difficult, ambiguous, or inconsistent were either revised or replaced. In the second phase, graduate students (n=20) whose previous jobs were in matrixed SPOs located at Wright-Patterson AFB (WPAFB) were selected to complete the revised survey instrument. An attempt was made to get as much diversity (and representativeness) as possible in this sample population. The twenty participants

represented eight different SPOs, seven work specialties (engineering, program control, test and evaluation, logistics, quality assurance, contracting, and configuration management) and included both Air Force officers and government civilians. After the students completed the instrument, an item-by-item discussion was held with each participant. These discussions resulted in only minor content modifications to the questionnaire in preparation for application to the study's target population. The third phase was an actual field test (n=10) of the survey instrument in two SPOs located at WPAFB. Item content of the questionnaire proved satisfactory.

About 200 different items were considered for inclusion in the survey instrument. On the basis of the above procedures, a final instrument was prepared, which contained 107 items (including 31 items for measuring the five bases of power). The order of items in the questionnaire were randomized to avoid response bias. Also, some of the items were phrased positively and others negatively to overcome the problems of acquiescence, i.e., "yea" or "nay" saying tendencies.

Sample Population

In an attempt to limit the number of Air Force surveys, the Air Force Military Personnel Center placed a limit of 200 personnel on the sample size to be surveyed in this study (a confidence interval of 90% +/- 10%). This decision left open only three options in determining the sample population:

(1) Randomly select individuals throughout Air Force Systems Command who work in matrixed SPOs. This option has the positive trait of being totally random and thus generalizable over the entire population. However, there is a very distinct possibility of getting only one to two respondents per organization; each of the functional areas within a SPO would not be represented. Such a limited sample from each organization would make drawing any conclusions virtually impossible.

(2) Selectively choose one large matrixed SPO. This option has the advantages of focusing on one work group, ensuring representation from each of the functional work areas, and ease of administration. In addition, this option would result in a sample group whose working relationships are likely familiar to all members of each functional area and who speak a common language, thus assuring a common reference point from which perceptual differences could be assessed. However, this option raises concerns over generalizing results outside this particular organization. In addition, there are only a limited number of project/functional managers in a single SPO. Thus, there is a high possibility of obtaining results that would be biased.

(3) The final possibility is to selectively choose a number of small matrixed SPOs until reaching the maximum sample size permitted by the Air Force Military Personnel Center. Like option 2, this choice has the advantages of ensuring representation from each of the functional areas, getting "standardized" organizations, as well as being relatively easy to administer. By choosing more than one

organization, there is also a greater opportunity to obtain varied responses. One organization may be differently managed than another -- a likely possibility for matrixed SPOs given the diversity in weapons systems developments. However, this option also has the disadvantage of being somewhat biased and limited in its generalizeable results.

Since this is an exploratory study on the nature of power in a matrix organization, the decision was made to go with option 3 and limit the study to three matrixed SPOs in the Air Force Systems Command. However, it should be noted that there is a possibility that the results of this study will not be generalizeable across the entire population.

Scientists have argued that much of behavioral research is not generalizeable because research procedures, i.e., choice of empirical setting and/or sampling procedures, necessarily limit the application of findings. Underlying this contention is a failure to recognize that generalizability is not a single issue (Calder et al., 1981). Calder et al. argue that two distinct types of application may be identified in behavioral research. The two types of generalizability are termed effect application and theory application. While the specific effects obtained in effect applications are expected to mirror findings that would be observed if data were collected for other populations and settings, effects observed in theory applications are employed to assess the status of theory. In theory application, it is the theoretical explanation that is expected to be generalizeable and not the particular effects obtained.

When theory application is the goal, Calder et al. (1981) maintain that respondents be selected to provide a rigorous test of the theory at issue. Generally speaking, it is accepted that because most scientific theories are universal in scope, any group of respondents can provide a test of the theory's predictions. Ideally, maximally homogenous respondents should be employed because homogenous samples typically provide a stronger test of the theory. They permit more exact theoretical predictions than may be possible with a heterogeneous group, and they decrease the chance of making false conclusions about whether there is a covariation between the variables under study. Thus, statistical conclusion validity is maximized or, at least, increased (Cook and Campbell, 1979). Since this study is an exploratory look at French and Raven's theory of power taxonomy, the choice of option 3 is considered satisfactory for theory application generalizability.

Given the sample size parameters detailed above, Wright-Patterson Air Force Base (WPAFB) proved to be fertile (and convenient) ground for the sample. There are more than a dozen major matrixed SPOs located at WPAFB. These SPOs range in size from approximately 50 personnel to well over 500 personnel. In keeping with the dictates noted above, and getting as many different types of SPOs as possible, the decision was made to survey the Advance Cruise Missile SPO, the Lantirn SPO, and the SRAM II SPO. Organizational charts were obtained from each of the SPOs, and surveys were sent to all matrixed personnel who were not Project or Functional Managers. The survey was distributed to a

convenience sample 189 project personnel (83 to Advanced Cruise Missile SPO; 52 to Lantirn SPO; and 54 to SRAM II SPO). Of the 189 surveys that were distributed, 136 were completed and returned; a return rate of 72.2 percent.

Research Assumptions

This study was based on the assumption that the five bases of power identified by French and Raven (1959) were applicable to the condition existing in Air Force matrixed SPOs. The statements included in the survey instrument were assumed to be appropriate and meaningful in work-related terms and related directly to the five power bases. The questionnaire and the data collection procedures also were assumed to have generated meaningful data which were accurate reflections of the study participants' views.

The survey respondents were assumed to have worked in an environment where an ambiguity in the authority structure existed and where power is shared between the project and functional managers. It was further assumed that variations in managerial effectiveness and use of power were observed and noted by the project personnel.

Methodological Objectives of the Study

A typology of five bases of social power developed by French and Raven (1959) has been used to study group behavior in field settings by various researchers but interpretation of these data is limited by several methodological shortcomings. The methodological objectives of this study are to correct the deficiencies discussed in Chapter II by

designing a multi-item instrument containing factorially independent subscales for measuring the five bases of managerial power, to provide substantial evidence of their reliabilities and validities, and to show that the subscales are free from social desirability response bias. This construct validation process for each of the measuring instruments is the subject of Chapter IV. Chapter V discusses the methods and results of testing each of the hypotheses presented in Chapter I.

IV. EMPIRICAL ANALYSIS: CONSTRUCT VALIDATION

Introduction

This chapter reports on the methodological aspects of this investigation. The theoretical aspects will be considered in Chapter V. As discussed in Chapters II and III, one significant objective of this research effort is to address and resolve as many of the measurement problems associated with the constructs on power as possible in a cross-sectional field study. Earlier sections explained the rationale for sequencing research activities so that construct validity is established before performing substantive research.

This chapter consists of six sections. The first section spells out the objectives and rationale used to establish valid multi-item measures of constructs. Construct validation can be distinguished by trait and nomological validity. Sections two and three discuss the trait validity of the measures (i.e., reliability of the measures and convergent/discriminant validity). The fourth section describes how each of the scales were purified. Section five takes up the nomological validity issue. The final section is a conclusion summarizing the results of the empirical analysis. Strong evidence is presented for establishing construct validity for each of the measuring scales used in this study.

Objectives and Rationale Used for Construct Validity

Construct validity pertains to the degree of correspondence between constructs and their measures, and is thus a necessary condition for theory development and testing (Bagozzi et al., 1979; Churchill, 1979; Cook and Campbell, 1979; Cronbach and Meehl, 1955; Nunnally, 1978; Peter, 1981; Zaltman et al., 1973). A useful distinction for examination of construct validity is between trait and nomological validity (Campbell, 1960).

Trait validity is investigated by considering a construct and its measures in a theoretical vacuum, thus providing necessary but not sufficient information for accepting construct validity. Trait validity includes the investigation of a measure's reliability, convergent validity, discriminant validity, as well as factor analyzing the dimensionality of a scale. Each of these four trait validity areas will now be addressed.

Reliability.

Reliability pertains to the degree to which measures are free from error and therefore yield consistent results (Nunnally, 1978; Peter, 1979). The three basic methods for assessing the reliability of a measurement scale are test-retest, internal consistency, and alternative forms, of which attempt to determine the proportion of variance in the scale that is systematic. The basic difference between the methods concerns what the scale is correlated with to compute the reliability estimate (Nunnally, 1978).

In the present study, the method chosen for assessing the reliability of the measurements was internal consistency of the scales. The test-retest reliability method was rejected due to methodological constraints and because the test-retest method suffers from at least three weaknesses (Kerlinger, 1986; Nunnally, 1978):

(1) Different results may be obtained depending on to length of time between measurement and remeasurement;

(2) If a change in the phenomenon occurs between the first and second administration, there is no way to distinguish between change and unreliability; and

(3) The retest correlation is only partly dependent of the correlation between different items in the scale, since a portion of the correlation of sums includes the correlation of each item with itself.

The alternative form reliability was also eliminated from consideration due to time constraints placed on this research project. In addition, this method requires the development of substantially equivalent alternative measures that are very hard to "prove" and develop (Gulliksen, 1950; Nunnally, 1978).

In contrast, the internal consistency reliability is assessed with the same instrument at one point in time. Internal consistency measures assess the homogeneity of a set of scale items based on the average inter-item correlations. Cronbach's coefficient alpha (Cronbach, 1951; Nunnally, 1978) utilizes item-to-total correlations to

assess the ability of responses to a single scale item to predict the overall scale score. Note also that coefficient alpha determines the mean reliability coefficient for all possible ways of splitting a set of items in half. Thus, the basic splitting problem associated with the common split-half internal consistency coefficient is resolved.

Convergent and Discriminant Validity.

Convergent validity is based on the correlation between responses obtained by maximally different methods of measuring the same construct (Campbell and Fiske, 1959), while discriminant validity is determined by demonstrating that a measure does not correlate very highly with another measure from which it should differ (Campbell, 1960).

In this study, the convergent and discriminant validity of the different bases of power measures were examined employing a factor analytic approach, testing the degree to which items of the same constructs loaded on the same factor and items of different constructs loaded on separate factors. The factor analytic approach was employed partly because it was recognized that the necessary conditions for using the multitrait-multimethod (MTMM) approach (Campbell and Fiske, 1959) were not fulfilled.

Factor Analysis.

By factor analyzing the measurement scales, trait validity was further substantiated. Factor analysis has the advantage of being able to reveal the dimensionality of measurement scales by identifying those

items which "hang together" the best (Kerlinger, 1973; Osgood et al., 1957).

Through the use of factor analysis, the questionnaire data gathered was rearranged into a set of factors. This was used for the following purposes:

1. To explain and detect patterning of variables.
2. To test hypotheses concerning the structuring of significant factors and factor loadings.
3. To construct indices which may be used as variables for follow-on analysis (Harmon, 1976; Nie et al., 1975).

The term "factor analysis" actually refers to a variety of mathematical procedures. For this research effort, principal-component analysis was used. Principle-component analysis is a "method of transforming a given set of variables into a new set of composite variables or principal components that are orthogonal (uncorrelated) to each other" (Nie et al., 1975). Thus, no assumption is required about the underlying structure of the variables. The objective is to find the best linear combination of variables that account for more of the variance in the data as a whole than any other linear combination of variables. The first principle component then is the single best summary of linear relationships in the data. The second component is the second best linear combination of variables, under the condition that the second component is orthogonal to the first component. Therefore, the second component accounts for the most residual value after the effect of the first component is removed from the data.

Subsequent components are defined similarly until the variance in the data is exhausted.

The outcome of a factor analysis heavily depends on how many factors are retained prior to rotation. Perhaps no problem has generated more controversy and misunderstanding than the number of factors problem (Stewart, 1981). Factoring should be stopped when additional factors are accounting for trivial variance (Rummel, 1970). Unfortunately, the criterion for retention of factors is uncertain (Ford et al., 1986; Humphreys et al., 1967) and various rules of thumb by researchers often lead to different solutions (Humphreys and Ilgen, 1969; Humphreys and Montanelli, 1974; Stewart, 1981; Zwick and Velicer, 1982; Zwick and Velicer, 1986).

For components analysis, it has been argued that the Kaiser criterion of retaining factors with eigenvalues greater than one appears to be most appropriate (Kim and Mueller, 1978; Weiss, 1976). This procedure is the default criterion built into most computer programs, including the one used in this study. However, studies have shown that the Kaiser criterion often incorrectly estimated the number of factors (Linn, 1968; Tucker et al., 1969; Zwick and Velicer, 1982; Zwick and Velicer, 1986). The best that can be said about the Kaiser criterion is that it provides an indication of the maximum number of factors in a data set.

The scree test has the most support among alternatives to the Kaiser criterion (Cattell 1966; Cattell and Vogelmann, 1977; Tucker et al., 1969; Zwick and Velicer, 1982; Zwick and Velicer, 1986). The

scree test involves plotting the eigenvalues obtained from decomposition of the correlation or covariance matrix. A large break in the plot of the eigenvalues is taken to indicate the point where factoring should stop. The procedure is relatively simple to apply. A straight edge is laid across the bottom portion of the eigenvalues to see where they form an approximately straight line. The point where the factors curve above the straight line gives the number of factors, the last factor being the one whose eigenvalue immediately precedes the straight line.

Most authorities in the field now recommend a combination of approaches for determining the number of factors to extract (Cattell, 1978; Gorusch, 1974; Harmon, 1976). The use of the Kaiser criterion (as an upper bound) and the scree test appears to provide an effective means for determining the number of factors.

To summarize the factorial approach, this study used an R-factor analysis (correlations between variables), extracted by principal-component solution. The number of factors extracted was determined by both the Kaiser criterion and the scree test. The resulting pattern was then orthogonally rotated. These factors were then applied to a conceptual model for variable definition and hypotheses testing. All factor analysis work was performed using the standard Statistical Package for the Social Sciences (SPSS) Program.

Trait validation was used to purify the measurement scales. Highly reliable and unidimensional scales for each construct were

constructed. Scale purification was based on variations of two general item analysis procedures advocated by Thomas and Petersen (1982).

Nomological validity is the degree to which predictions from theoretical networks containing the constructs are confirmed. It is based on the explicit investigation of constructs and measures in terms of formal hypotheses derived from theory (Peter, 1981). In the present study, supportive evidence of nomological validity was provided by computing the correlations between variables which were hypothesized to be related.

Trait Validity: Reliability of Measures

Internal consistency reliabilities (coefficient alphas) of the initial scales were computed for each variable measured (Nunnally, 1978; Peter, 1979). The results of the reliability tests for the original scales are reported in Appendix B. A summary of the test results is given in Table 5.

Nunnally (1978) maintains that coefficient alpha is of great importance because its square root is the estimated correlation of the k-item test with errorless true scores. Thus, a large alpha indicates that the sample of items performs well in capturing the construct which motivated the measure. But what is a sufficiently large alpha in an actual situation? Nunnally (1978) suggests that in the early stages of research only modest reliabilities, i.e., coefficient alphas of .70 or higher, will suffice. For most research purposes, Nunnally argues,

Table 5

Summary of Reliability Analysis

SCALE	NUMBER OF CASES	NUMBER OF ITEMS	COEFF ALPHA	STANDARD ITEM ALPHA	LOWEST ITEM- TO-TOTAL- CORRELATION
Project Manager's Reward Power	136	6	0.91	0.91	0.88
Project Manager's Coercive Power	136	7	0.84	0.87	0.77
Project Manager's Legitimate Power	136	6	0.77	0.78	0.72
Project Manager's Expert Power	136	6	0.72	0.77	0.60
Project Manager's Referent Power	136	6	0.85	0.87	0.81
Functional Manager's Reward Power	132	6	0.90	0.90	0.86
Functional Manager's Coercive Power	132	7	0.89	0.88	0.85
Functional Manager's Legitimate Power	132	6	0.94	0.94	0.92
Functional Manager's Expert Power	132	6	0.86	0.86	0.80
Functional Manager's Referent Power	132	6	0.94	0.94	0.91
Project Manager's Effectiveness	132	5	0.93	0.93	0.90
Functional Manager's Effectiveness	132	5	0.96	0.96	0.94
Project Manager's Overall Influence	132	7	0.84	0.84	0.80
Functional Manager's Overall Influence	132	7	0.88	0.89	0.85

increasing reliabilities much beyond .80 is often wasteful of time and funds.

As can be seen from Table 5, the internal consistency reliabilities (coefficient alphas) range from 0.77 to 0.96. These high coefficient alphas strongly suggest that the scales are very reliable and that internal consistency of the initial measures should be considered satisfactory. Purification of the measures will be discussed in more detail in a later section.

Trait Validity: Convergent and Discriminant Validity

The convergent and discriminant validity of the different bases of power measures were assessed by common factor analysis. Items measuring a single construct were expected to load on the same factor (evidence of convergent validity), while items measuring differing constructs were expected to load on separate factors, and a single item was not expected to load on several factors (evidence of discriminant validity).

As an alternative to factor analysis, simple correlation analysis was considered. Inspection of the full correlation matrices for all items in each variable could provide evidence of convergent as well as discriminant validity. For example, high intercorrelations among items measuring a single construct would be taken as evidence of convergent validity, whereas low correlations between items measuring different constructs would be considered evidence of discriminant validity. Since factor analysis takes covariation among items into account, it

was decided not to carry out a separate inspection of correlation matrices.

As previously indicated, the multitrait-multimethod (MTMM) approach (Campbell and Fiske, 1959) was not employed. Neither were more sophisticated methods, e.g., analysis of covariance structures (Bagozzi, 1978; Hughes et al., 1986).

Three separate sets of variables were factor analyzed independently. Factor extraction was accomplished by a principal axes factoring with squared multiple correlations in the main diagonal as initial communality estimates (Nie et al., 1975). The extracted factors, assuming that there were more than one, were rotated using the Varimax method.

Bases of Power of the Project Manager.

Five factors were extracted from the items constituting the different power bases of the project manager. The Kaiser criterion (eigenvalue > 1.00) suggests that a maximum of eight factors should be examined. However, the scree plot of the eigenvalues (see Figure 3) shows that only five factors should be rotated. The results of the varimax rotated factor analysis are reported in Table 6. The five factors accounted for 60.6% of the total variance. The first factor clearly reflected the coercive power of the project manager with heavy loadings (exceeding .72) on six of the seven items constituting this variable (COPM1 - COPM7). Only the single item COPM3 (with loading of -.002) failed the significance test of 0.500. This almost zero loading on Factor 1, along with the fact that COPM3 did not load significantly

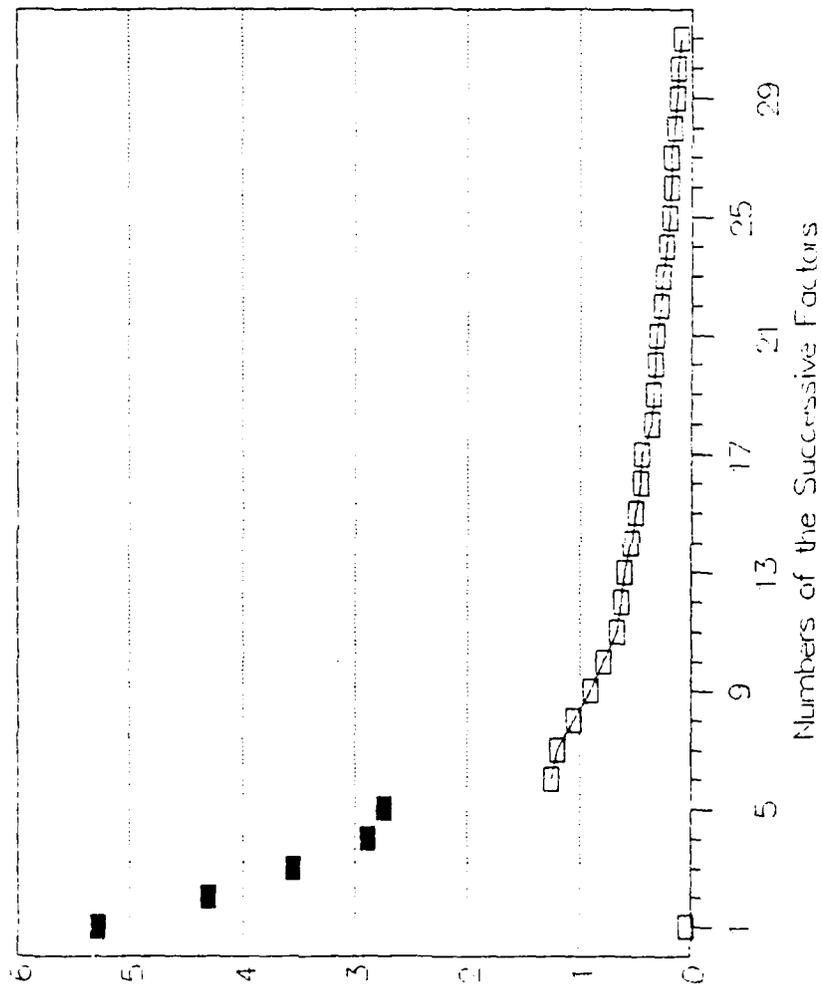


Figure 3. Project Manager's Bases of Power Scree Plot

Size of Eigenvalues

Table 6¹

The Project Manager's Bases of Power:
Varimax Rotated Factor Matrix

VARIABLE	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	COMMUNALITY
REPM1	-.137	<u>.840</u>	-.085	.002	.016	.732
REPM2	-.121	<u>.699</u>	-.033	-.059	-.025	.509
REPM3	-.056	<u>.867</u>	-.033	-.057	.051	.762
REPM4	-.061	<u>.760</u>	-.068	-.178	.081	.624
REPM5	.020	<u>.863</u>	-.017	-.015	-.036	.747
REPM6	-.106	<u>.854</u>	-.023	-.059	.018	.745
COPM1	<u>.726</u>	-.019	.096	-.122	.021	.552
COPM2	<u>.871</u>	-.082	-.038	.050	.107	.781
COPM3	-.002	.120	-.039	.127	-.027	.033
COPM4	<u>.860</u>	-.093	.052	-.067	.023	.755
COPM5	<u>.929</u>	-.039	-.074	.021	.057	.873
COPM6	<u>.871</u>	-.132	-.062	-.002	.014	.780
COPM7	<u>.832</u>	-.071	-.044	.001	-.088	.707
LEPM1	.026	.003	-.165	-.033	<u>.737</u>	.573
LEPM2	-.012	-.170	-.084	-.063	<u>.658</u>	.473
LEPM3	.070	-.006	-.087	-.133	<u>.711</u>	.536
LEPM4	-.034	.097	.057	.067	<u>.715</u>	.530
LEPM5	.103	.002	-.009	.205	<u>.647</u>	.471
LEPM6	-.033	.070	.021	.008	<u>.648</u>	.426
EXPM1	.087	-.286	.066	<u>.653</u>	.014	.521
EXPM2	.015	-.284	.012	<u>.704</u>	-.055	.580
EXPM3	-.115	-.016	-.016	<u>.792</u>	.032	.642
EXPM4	-.028	.023	.043	<u>.849</u>	.065	.728
EXPM5	-.015	.060	-.011	<u>.865</u>	-.028	.752
EXPM6	.222	-.056	-.037	.072	-.217	.106
RFPM1	-.049	.011	<u>.859</u>	.034	-.080	.748
RFPM2	.017	-.009	<u>.718</u>	-.057	-.062	.522
RFPM3	.000	-.010	<u>.751</u>	-.067	-.134	.596
RFPM4	.062	-.142	<u>.849</u>	.009	-.015	.745
RFPM5	-.051	-.057	<u>.867</u>	-.053	-.107	.772
RFPM6	-.062	-.002	<u>.621</u>	.188	.179	.457
Eigenvalue	5.286	4.319	3.559	2.881	2.742	
Pct of Var	17.1	13.9	11.5	9.3	8.8	60.6

¹ Items of greater than 0.500 are underscored for emphasis

on any of the four other variables, lead to a re-examination of this question. COPM3 states, "My Project Manager is critical of my work even when I perform well." This statement asks the respondent how his/her Project Manager behaves in a noncontingent manner toward work performance. Since one of the primary criteria for writing behaviorally anchored items was that they were contingent upon work performance, COPM3 should not have been included in the survey instrument. This issue is discussed in detail in the scale purification section.

The second factor extracted the reward power of the project manager with heavy loadings (exceeding .699) on all six items that made up the scale. Factors three, four, and five clearly reflected the project manager's referent, expert, and legitimate powers respectively. Loadings on each of these factors exceeded .62 with the exception of one item, EXPM6, which did not load on any of the five factors.

Communalities are also reported. Only the COPM3 and EXPM6 variables generated extremely low communalities. These results provide additional evidence that these two items should be deleted from further analysis and testing.

Generally speaking, the factor analysis reported in Table 6 supports a high convergent validity for all of the variables. In addition, since the variables did not load heavily on any of the other factors (all below .300), there is high confidence of the scale's discriminant validity.

Bases of Power of the Functional Manager.

Since the literature shows that the project and functional managers share managerial power in a matrix organization, a separate factor analysis was performed for each of these manager's bases of power rather than combining them together. It was expected that each manager would have a different scale measuring his/her bases of power.

Figure 4 shows the scree plot of the eigenvalues using all the items constituting the different power bases of the functional manager. Both the scree plot and the Kaiser criterion suggest that six factors should be rotated. Table 7 presents the final varimax rotated factor loadings matrix. The six factors account for 77.5% of the total variance. Each of the factors is clearly interpretable. The first factor extracted is the coercive power of the functional manager. The second through fifth factors are the functional manager's legitimate, referent, expert, and reward powers respectively. All five factors displayed heavy loadings (exceeding .66) for each of the variables comprising the separate power scales. Again, like the bases of power scale for the project manager, the variables COFM3 and EXFM6 were the only items that did not load on the five predicted power sources. As pointed out in the discussion about the project manager's bases of power scale, COFM3 refers to noncontingent work performance. This item should not have been included on the final survey instrument. EXFM6 states, "My Functional Manager does not know what (s)he is doing." This item was reverse scored for analysis. However, the scale the respondent must use in answering this item goes from "never" to

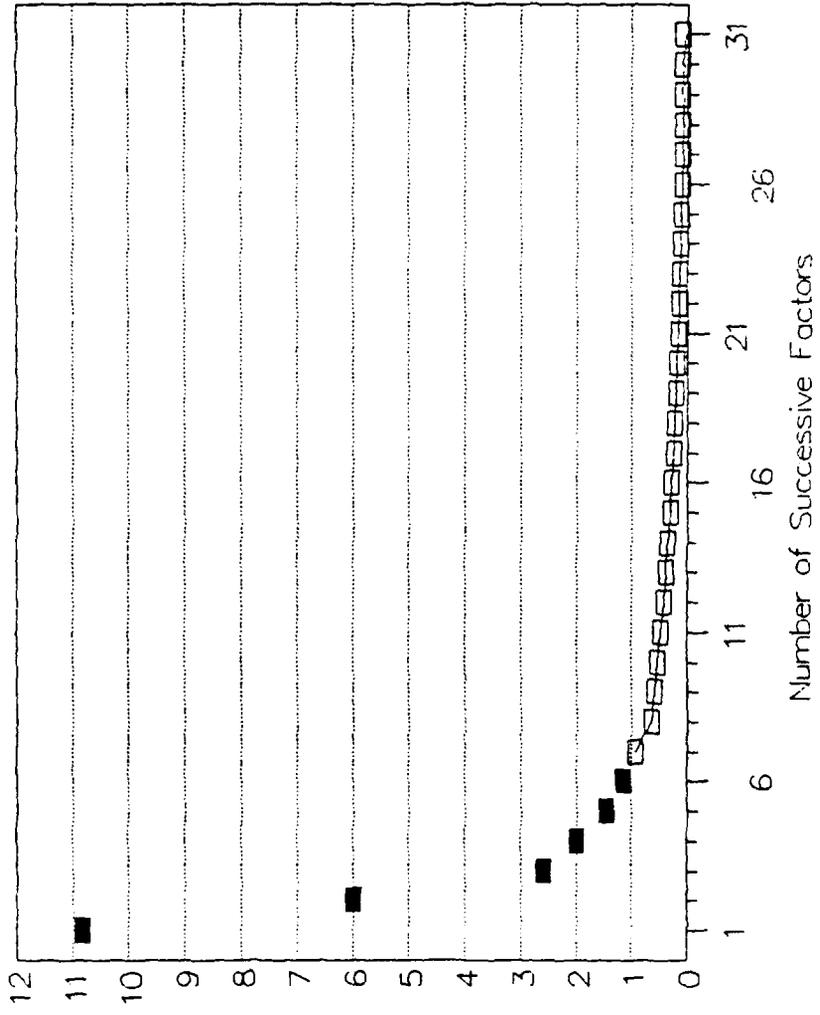


Figure 4. Functional Manager's Bases of Power Scree Plot

Size of Eigenvalues

Table 7¹

The Functional Manager's Bases of Power:
Varimax Rotated Factor Matrix

VARIABLE	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	COMMU- NALITY
REFM1	.088	.300	.116	-.039	<u>.665</u>	-.428	.737
REFM2	.304	.372	-.146	.031	<u>.661</u>	.225	.741
REFM3	.364	.234	-.237	-.063	<u>.667</u>	.136	.711
REFM4	.246	.156	.040	.142	<u>.794</u>	.142	.758
REFM5	.340	.199	-.074	.027	<u>.751</u>	.144	.747
REFM6	.356	.234	-.368	-.115	<u>.698</u>	.115	.830
COFM1	<u>.721</u>	.209	-.254	-.074	.251	-.320	.799
COFM2	<u>.866</u>	.119	-.263	-.108	.208	-.083	.896
COFM3	.020	-.138	.013	.199	-.278	-.480	.366
COFM4	<u>.800</u>	.241	-.187	-.069	.178	.058	.772
COFM5	<u>.873</u>	.130	-.270	-.134	.218	-.065	.921
COFM6	<u>.785</u>	.096	-.187	-.044	.328	-.103	.781
COFM7	<u>.796</u>	.127	-.268	-.064	.195	.033	.765
LEFM1	-.024	<u>.753</u>	-.069	.046	.185	-.269	.681
LEFM2	.141	<u>.876</u>	-.039	.068	.192	.118	.840
LEFM3	.199	<u>.898</u>	-.015	.082	.102	.102	.865
LEFM4	.134	<u>.880</u>	-.010	-.031	.261	.029	.863
LEFM5	.121	<u>.896</u>	.000	.058	.182	.018	.854
LEFM6	.182	<u>.842</u>	-.080	.031	.082	.050	.759
EXFM1	-.166	-.008	.368	<u>.725</u>	.079	-.226	.747
EXFM2	.001	.120	.238	<u>.854</u>	.000	.137	.820
EXFM3	-.029	.060	.179	<u>.803</u>	-.060	-.178	.717
EXFM4	-.135	.004	.295	<u>.834</u>	.118	.054	.818
EXFM5	-.096	.079	.246	<u>.840</u>	-.072	.122	.801
EXFM6	-.204	-.047	.195	.123	.151	<u>.751</u>	.683
RFFM1	-.221	-.065	<u>.697</u>	.235	.076	-.160	.625
RFFM2	-.327	-.052	<u>.839</u>	.221	-.104	.063	.877
RFFM3	-.248	-.009	<u>.819</u>	.292	-.090	.040	.828
RFFM4	-.288	-.019	<u>.864</u>	.260	-.083	.103	.915
RFFM5	-.248	-.026	<u>.824</u>	.206	-.174	.031	.815
RFFM6	-.064	-.057	<u>.780</u>	.245	-.066	.155	.704
Eigen- value	10.823	5.997	2.604	1.996	1.462	1.154	
Pct of Var	34.9	19.3	8.4	6.4	4.7	3.7	77.5

¹Items greater than 0.500 are underscored for emphasis

"always". Since both the item and the response are both negative, there is a strong possibility of confusion on the part of the respondent to a double-negative question. For example, does an answer of "1", "My Functional Manager never does not know when (s)he is doing" equate to "My Functional Manager always knows what (s)he is doing" for an average respondent? Thus, EXFM6 (as well as EXPM6) are candidates for deletion from further analysis and testing. These issues will be further addressed in the scale purification section.

The factor analysis reported in Table 7 strongly suggests a high convergent as well as discriminant validity for the functional manager's bases of power variables. Loadings exceeded .400 only on the principle factors.

Managerial Effectiveness and Influence Variables

The final set of variables factor analyzed were those items related to managerial effectiveness and to the influence of the project and functional managers. The scree test (see Figure 5) on these variables shows that only four factors should be rotated as opposed to the Kaiser criterion maximum of five factors. Since this adheres with the inherent nature of the variables, only four factors were rotated. Table 8 presents the factor analysis of these four variables. The four factors extracted accounted for 68.5% of the total variance. Each of the factors is clearly interpretable with all variables loading heavily (all exceeding .600) on each expected factor. In turn, the factors can be labeled as the functional manager's effectiveness rating, the

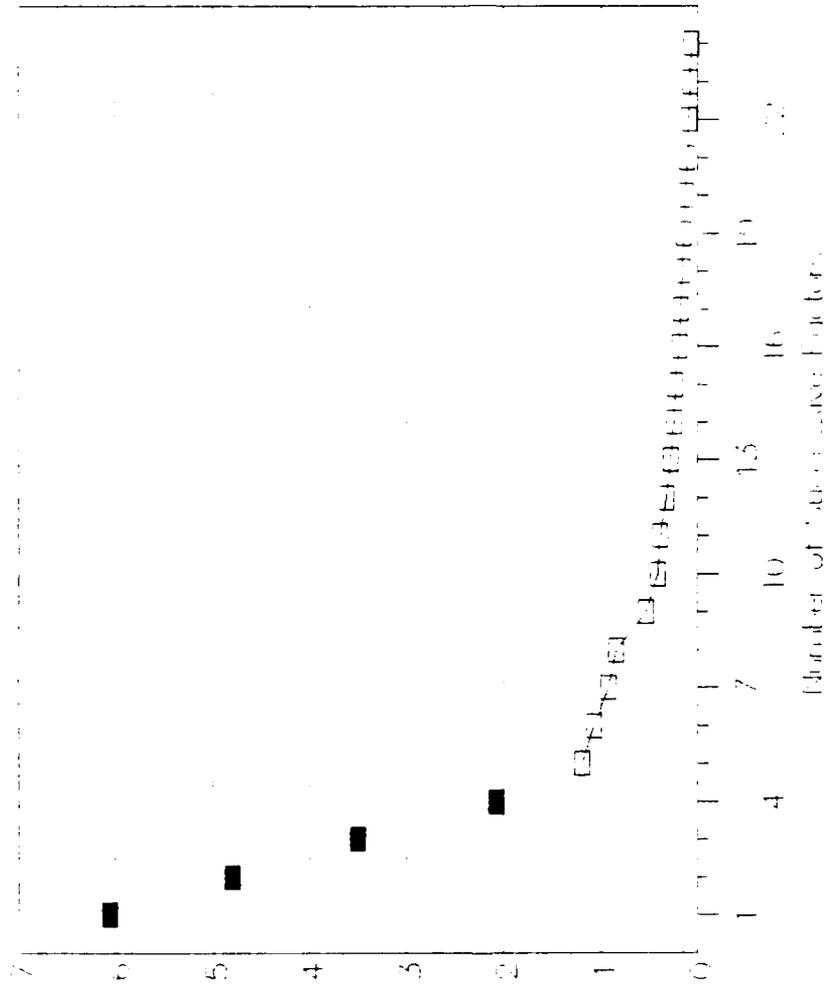


Figure 5. Effectiveness and Influence Variables Scree Plot

Table 8¹

Managerial Effectiveness and Influence Variables:
Varimax Rotated Factor Matrix

VARIABLE	FACTOR1	FACTOR2	FACTOR3	FACTOR4	COMMUNALITY
PMEFF1	.120	-.016	<u>.762</u>	.014	.595
PMEFF2	.077	.058	<u>.903</u>	.000	.824
PMEFF3	.181	.023	<u>.881</u>	.023	.809
PMEFF4	.061	.066	<u>.898</u>	-.042	.816
PMEFF5	.034	.031	<u>.918</u>	-.010	.845
FMEFF1	<u>.945</u>	.109	.030	.000	.906
FMEFF2	<u>.927</u>	.078	.110	.040	.879
FMEFF3	<u>.946</u>	.091	.061	.019	.907
FMEFF4	<u>.894</u>	.100	.149	.012	.833
FMEFF5	<u>.830</u>	.186	.158	.054	.751
PMINFLU1	-.137	-.127	-.117	<u>.658</u>	.482
PMINFLU2	-.085	-.011	.219	<u>.695</u>	.539
PMINFLU3	.223	-.437	.014	<u>.680</u>	.703
PMINFLU4	.010	-.311	-.107	<u>.702</u>	.611
PMINFLU5	.228	-.339	.015	<u>.693</u>	.647
PMINFLU6	-.048	-.041	.070	<u>.608</u>	.378
PMINFLU7	.073	-.004	-.103	<u>.738</u>	.561
FMINFLU1	.115	<u>.812</u>	.052	.020	.675
FMINFLU2	.185	<u>.618</u>	-.188	-.029	.452
FMINFLU3	.037	<u>.714</u>	.119	-.294	.612
FMINFLU4	.002	<u>.798</u>	.183	-.166	.697
FMINFLU5	-.030	<u>.712</u>	.081	-.208	.559
FMINFLU6	.149	<u>.842</u>	.035	-.136	.752
FMINFLU7	.220	<u>.731</u>	-.081	-.135	.607
Eigenvalue	6.056	4.800	3.503	2.079	
Pct of Var	25.2	20.0	14.6	8.7	68.5

¹Items of greater than 0.500 are underscored for emphasis

functional manager's work influence, the program manager's effectiveness rating, and the program manager's work influence. The low loadings (all less than .300) outside of each of the principle factors, provides strong evidence for both convergent and discriminate validity of these scales.

Summary of Convergent and Discriminant Validity.

The factor analyses reported in this section provided considerable evidence for both convergent and discriminant validity. However, some minor deficiencies were observed. Such deficiencies (or lack of convergent and discriminant validity) should be corrected in the scale purification process where the objective is to construct revised, unidimensional measurement scales for each construct. Scale purification is discussed in the next section.

Scale Purification

The objective of scale purification is to construct highly reliable, unidimensional scales of multiple items for each construct. This was accomplished by performing item analysis.

Variations of three general item analysis approaches are commonly employed (e.g., Thomas and Petersen, 1982). First, if an understanding of the construct leads to the expectation that two groups will differ on item responses, this expectation can be tested directly (Cronbach and Meehl, 1955; Brinton, 1969). For example, t-tests can be used to identify those items that discriminate the best between the two groups. A problem generated by t-tests, however, is that relatively small mean differences between item means become statistically significant as the

size of the samples becomes even moderately large. In this study, the t-test approach was considered but, partly due to the problems associated with establishing the two groups, was not actually carried out.

Secondly, item-to-total scale correlations may be used to assess the ability of responses to a single scale item to predict the overall scale score (Cronbach, 1951). The initial item-to-total scale correlations of this study were reported in Appendix B. Also, the internal consistency reliabilities of the fourteen scales were computed (cf. Table 5, page 91). Basically, each scale is purified by iteratively eliminating the items with the lowest item-to-total correlations until the coefficient alpha reaches a maximum. First, however, it is desirable to avoid skewed items by eliminating those that exhibit extreme means.

Finally, as already indicated, factor analysis may be used to identify the dimensionality of the scales (Nunnally, 1978). The objective of factor analyzing the purified scales is to ensure that each construct is represented by a unidimensional scale in the subsequent testing of hypotheses. The following paragraphs discuss the purification of each scale in turn.

Project Manager's Reward Power Scale.

The project manager's reward power scale originally consisted of six items, cf. Appendix B and Table 5. An increase (from .9052 to .9058) in coefficient alpha could be obtained by deleting the REPM2 item. This increase, however, is extremely insignificant and thus the

original six items were kept for the final scale. A factor analysis of these six items resulted in a one factor solution. The eigenvalue was 4.10 and the factor accounted for 68.4% of the total variance. The factor loadings are reported below in Table 9.

Table 9

Factor Loadings: Project Manager's Reward Power

REPM1	"My Project Manager recommended me for a promotion each time I was qualified."	.85
REPM2	"My Project Manager personally pays me a compliment when/if I do outstanding work."	.72
REPM3	"My Project Manager rewards me with desirable job assignments."	.88
REPM4	"When/if I do outstanding work, my Project Manager rewards me with high performance ratings or tells the person who writes my performance evaluation."	.79
REPM5	"My Project Manager recommends me for awards or commendations when my work is consistently above average."	.85
REPM6	"My Project Manager makes sure I get rewarded with time off when my work performance is especially good."	.86

Project Manager's Coercive Power Scale.

Next, the project manager's coercive power scale was analyzed. Item 3 (COPM3) was deleted for several reasons. As previously discussed, COPM3 really measures a project manager's coercive power

based on noncontingent subordinate work performance. The question violates the original premise of constructing behaviorally anchored items that are contingent upon work performance. Also, COPM3 should be deleted due to skewness (extreme mean). As expected, COPM3 had the lowest item-to total correlation of any item in the original 7-item scale. By removing COPM3 from the scale, coefficient alpha was increased from .84 to .92. A further increase (from .924 to .931) in coefficient alpha could be obtained by eliminating item 1 (COPM1) from the scale. However, the increase would be quite marginal and hence it was decided to retain the COPM1 item.

A factor analysis, covering the six items constituting the revised coercive power of the project manager scale, resulted in one factor with eigenvalue 4.40. The factor extracted accounted for 73.3% of the total variance. The factor loadings are reported in Table 10.

Table 10

Factor Loadings: Project Manager's Coercive Power

COPM1	"My Project Manager takes disciplinary action or reprimands me when/if my work is below standard."	.73
COPM2	"My Project Manager gives me undesirable job assignments when/if I don't cooperate with him or her."	.88
COPM4	"My Project Manager makes me work overtime when I don't meet established task deadlines."	.87
COPM5	"My Project Manager gives me extra work as punishment when/if I don't comply with his or her orders."	.93
COPM6	"My Project Manager gives me low performance ratings when/if I work below acceptable standards or tells the person who writes by performance evaluation."	.89
COPM7	"My Project Manager chews me out when I perform badly."	.83

Project Manager's Legitimate Power Scale.

For the project manager's legitimate power scale, six items were initially included. Interestingly, if any item is deleted from this scale, coefficient alpha decreases, suggesting the original scale was adequate. Therefore, all six original items were kept for the final scale. A factor analysis of these six items resulted in one factor with eigenvalue 3.75, accounting for 65.3% of the total variance. Factor loadings are shown in Table 11.

Table 11

Factor Loadings: Project Manager's Legitimate Power

LEPM1	"My Project Manager exercises a lot of authority over how I perform my job."	.77
LEPM2	"My Project Manager expects me to follow his or her requests since we are both on the same team and thus working toward the same goal."	.67
LEPM3	"My Project Manager expects his or her recommendations will be carried out since (s)he is the senior manager on my team."	.73
LEPM4	"My Project Manager lets me know (s)he has the right to expect my cooperation because (s)he outranks me."	.72
LEPM5	"My Project Manager tells me what to do because (s)he has the authority to do so."	.65
LEPM6	"My Project Manager expects me to follow his or her orders because (s)he has information that I don't have and thus a good reason for issuing any order."	.63

Project Manager's Expert Power Scale.

The project manager's expert power scale initially consisted of six items, but item 6 (EXPM6) was eliminated due to an extremely low item-to-total correlation. As noted previously, EXPM6 is also a double-negative statement that is likely to present some interpretability problems for respondents. By deleting EXPM6 from the expert scale, coefficient alpha increased from .725 to .841. If any of the remaining five items were deleted from the scale, coefficient alpha would decrease. Thus, the final coefficient alpha and standardized

item alpha were .84. A factor analysis of the revised scale resulted in one factor with eigenvalue 3.10, accounting for 62.1% of the total variance. Factor loadings are reported below in Table 12.

Table 12
Factor Loadings: Project Manager's Expert Power

EXPM1	"My Project Manager provides me with sound, job related advice."	.70
EXPM2	"My Project Manager gets me to accomplish the work by demonstrating the (s)he knows how to perform the task."	.75
EXPM3	"My Project Manager makes on the spot corrections."	.79
EXPM4	"My Project Manager impresses me with his or her overall competence and ability."	.84
EXPM5	"My Project Manager shares his or her experience and/or training with me."	.85

Project Manager's Referent Power Scale.

Similarly, the project manager's referent power scale, initially consisting of six items, was analyzed. Since only a minor increase in coefficient alpha (from .853 to .878) could be obtained by deleting item 6 (RFPM6), the original six items were kept for the final scale. A factor analysis was performed, resulting in a one factor solution. The eigenvalue was 3.71 and the factor accounted for 61.9% of the total variance. Factor loadings are reported in Table 13.

Table 13

Factor Loadings: Project Manager's Referent Power

RFPM1	"My Project Manager relies on our good relations with one another to get the job done."	.86
RFPM2	"My Project Manager makes me feel like (s)he approves of me as a person."	.73
RFPM3	"My Project Manager sets the example and relies upon me to follow his or her example."	.77
RFPM4	"My Project Manager makes me feel valued."	.85
RFPM5	"My Project Manager relies on me to get the job done because I don't want to let him or her down."	.88
RFPM6	"My Project Manager relies on our friendship in getting me to do the job."	.60

Functional Manager's Reward Power Scale.

The functional manager's reward power scale originally consisted of six items. An increase (from .895 to .910) in coefficient alpha could be obtained by deleting the REFPM1 item. This increase, however, is relatively insignificant and thus the original six items were kept for the final scale. A factor analysis of these six items resulted in a one factor solution. The eigenvalue was 4.03 and the factor accounted for 67.1% of the total variance. The factor loadings are reported in Table 14.

Table 14

Factor Loadings: Functional Manager's Reward Power

REFM1	"My Functional Manager recommended me for a promotion each time I was qualified."	.61
REFM2	"My Functional Manager personally pays me a compliment when/if I do outstanding work."	.85
REFM3	"My Functional Manager rewards me with desirable job assignments."	.85
REFM4	"When/if I do outstanding work, my Functional Manager rewards me with high performance ratings or tells the person who writes my performance evaluation."	.84
REFM5	"My Functional Manager recommends me for awards or commendations when my work is consistently above average."	.86
REFM6	"My Functional Manager makes sure I get rewarded with time off when my work performance is especially good."	.88

Functional Manager's Coercive Power Scale.

Next, the functional manager's coercive power scale was analyzed. As previously discussed, COPM3 appears to measure a functional manager's coercive power based on noncontingent subordinate work performance. Since this violates the contingent work performance premise established for all measuring items, COFM3 was deleted. By removing COFM3 from the scale, coefficient alpha was increased from .89 to .95, and the remaining six items were retained in the final scale. A factor analysis, using

the six remaining items in the revised coercive power of the project manager scale, resulted in one factor with eigenvalue 4.83. The factor extracted accounted for 80.5% of the total variance. The factor loadings are reported below in Table 15.

Table 15
Factor Loadings: Functional Manager's Coercive Power

COFM1	"My Functional Manager takes disciplinary action or reprimands me when/if my work is below standard."	.88
COFM2	"My Functional Manager gives me undesirable job assignments when/if I don't cooperate with him or her."	.95
COFM4	"My Functional Manager makes me work overtime when I don't meet established task deadlines."	.85
COFM5	"My Functional Manager gives me extra work as punishment when/if I don't comply with his or her orders."	.96
COFM6	"My Functional Manager gives me low performance ratings when/if I work below acceptable standards or tells the person who writes by performance evaluation."	.87
COFM7	"My Functional Manager chews me out when I perform badly."	.87

Functional Manager's Legitimate Power Scale.

For the functional manager's legitimate power scale, six items were initially included. Only a very marginal increase in coefficient

alpha (from .942 to .950) could be achieved if item 1 (LEFM1) were deleted from the scale. Thus, all six original items were kept for the final scale. A factor analysis of these six items resulted in one factor with eigenvalue 4.72, accounting for 78.6% of the total variance. Factor loadings are shown below in Table 16.

Table 16

Factor Loadings: Functional Manager's Legitimate Power

LEFM1	"My Functional Manager exercises a lot of authority over how I perform my job."	.76
LEFM2	"My Functional Manager expects me to follow his or her requests since we are both on the same team and thus working toward the same goal."	.91
LEFM3	"My Functional Manager expects his or her recommendations will be carried out since (s)he is the boss."	.93
LEFM4	"My Functional Manager lets me know (s)he has the right to expect my cooperation because (s)he outranks me."	.92
LEFM5	"My Functional Manager tells me what to do because (s)he has the authority to do so."	.92
LEFM6	"My Functional Manager expects me to follow his or her orders because (s)he has information that I don't have and thus a good reason for issuing any order."	.86

Functional Manager's Expert Power Scale.

The functional manager's expert power scale initially included six items. As noted previously, EXFM6 is a double-negative item posing potential interpretability problems for respondents. Such vagueness in the item probably accounts for EXFM6 actually loading as a separate factor. By deleting EXFM6 from the expert scale, coefficient alpha increased from .859 to .898. If any of the remaining five items were deleted from the scale, coefficient alpha would decrease. Thus, the final coefficient alpha and standardized item alpha were .90. A factor analysis of the revised scale resulted in one factor with eigenvalue 3.72, accounting for 74.5% of the total variance. Factor loadings are reported below in Table 17.

Table 17

Factor Loadings: Functional Manager's Expert Power

EXFM1	"My Functional Manager provides me with sound, job related advice."	.84
EXFM2	"My Functional Manager gets me to accomplish the work by demonstrating the (s)he knows how to perform the task."	.88
EXFM3	"My Functional Manager makes on the spot corrections."	.82
EXFM4	"My Functional Manager impresses me with his or her overall competence and ability."	.89
EXFM5	"My Functional Manager shares his or her experience and/or training with me."	.85

Functional Manager's Referent Power Scale.

The functional manager's referent power scale, initially consisting of six items, was similarly analyzed. Since only a minor increase in coefficient alpha (from .940 to .947) could be obtained by deleting item 1 (RFFM1), the original six items were kept for the final scale. A factor analysis was performed, resulting in a one factor solution. The eigenvalue was 4.66 and the factor accounted for 77.6% of the total variance. Factor loadings are reported below in Table 18.

Table 18

Factor Loadings: Functional Manager's Referent Power

RFFM1	"My Functional Manager relies on our good relations with one another to get the job done."	.75
RFFM2	"My Functional Manager makes me feel like (s)he approves of me as a person."	.94
RFFM3	"My Functional Manager sets the example and relies upon me to follow his or her example."	.92
RFFM4	"My Functional Manager makes me feel valued."	.96
RFFM5	"My Functional Manager relies on me to get the job done because I don't want to let him or her down."	.90
RFFM6	"My Functional Manager relies on our friendship in getting me to do the job."	.81

Project Manager's Effectiveness Scale.

The project manager's effectiveness scale initially consisted of five items. Since only a marginal increase in coefficient alpha (from 0.927 to 0.937) could be obtained by deleting item 1 (PMEFF1), the final scale consisted of the original five items. A factor analysis of these five items resulted in one factor with eigenvalue 3.94, accounting for 78.8% of the total variance. Factor loadings are reported below in Table 19.

Table 19

Factor Loadings: Project Manager's Effectiveness

PMEFF1	"My Project Manager is an effective manager."	.78
PMEFF2	"My Project Manager displays effective managerial behaviors."	.92
PMEFF3	"My Project Manager displays strong managerial abilities."	.92
PMEFF4	"My Project Manager is one of the best managers I have ever had."	.90
PMEFF5	"My Project Manager is one of the best managers in my SPO."	.91

Functional Manager's Effectiveness Scale.

The functional manager's effectiveness scale consisted of the same five items as the project manager's effectiveness scale. Since coefficient alpha only decreases if any of the items are deleted, the final scale remained the same as originally conceived. A factor analysis of the final scale resulted in a one factor solution. The eigenvalue was 4.30 and the factor accounted for 86.1% of the total variance. The factor loadings are reported below in Table 20.

Table 20

Factor Loadings: Functional Manager's Effectiveness

FMEFF1	"My Functional Manager is an effective manager."	.95
FMEFF2	"My Functional Manager displays effective managerial behaviors."	.94
FMEFF3	"My Functional Manager displays strong managerial abilities."	.94
FMEFF4	"My Functional Manager is one of the best managers I have ever had."	.92
FMEFF5	"My Functional Manager is one of the best managers in my SPO."	.89

The results of both the project and functional manager's effectiveness scales are similar to the results obtained by Ragins (1988). Ragins' global managerial effectiveness items were slightly

changed in this study to fit the context of a matrix management environment. Together, these two studies provide strong evidence for the validity and reliability of these managerial effectiveness scales.

Project Manager's Influence Scale.

For the project manager's influence scale, seven items were initially included. Coefficient alpha cannot be increased by deleting any of the items. None of the original seven items displayed any skewness problems or unacceptable item-to-total correlations. Thus, a factor analysis was performed on the original scale, resulting in one factor with eigenvalue 4.61. The extracted factor accounted for 70.0% of the total variance. The factor loadings are reported in Table 21.

Functional Manager's Influence Scale.

The functional manager's influence consisted of the same seven items as the project manager's influence scale. Not surprisingly, the two scales displayed consistent results. None of the seven items had low item-to-total correlations or extreme means. Coefficient alpha could not be increased through selective elimination of any of the items. A factor analysis of the final scale resulted in one factor with eigenvalue 4.18, accounting for 59.8% of the total variance. The factor loadings are reported in Table 22.

Table 21

Factor Loadings: Project Manager's Influence

PMINFLU1	"Overall, how much does your Project Manager influence the technical details of your project work?"	.66
PMINFLU2	"How much does your Project Manager influence your future work assignments?"	.66
PMINFLU3	"How much does your Project Manager influence your appraisal rating?"	.81
PMINFLU4	"How much does your Project Manager influence the technical <u>quality</u> of your project work?"	.77
PMINFLU5	"How much does your Project Manager influence your salary and/or promotion recommendations?"	.80
PMINFLU6	"How much does your Project Manager influence your work hours?"	.60
PMINFLU7	"How much does your Project manager influence the setting of deadlines for your project work?"	.69

Table 22

Factor Loadings: Functional Manager's Influence

FMINFLU1	"Overall, how much does your Functional Manager influence the technical details of your project work?"	.81
FMINFLU2	"How much does your Functional Manager influence your future work assignments?"	.65
FMINFLU3	"How much does your Functional Manager influence your appraisal rating?"	.76
FMINFLU4	"How much does your Functional Manager influence the technical <u>quality</u> of your project work?"	.79
FMINFLU5	"How much does your Functional Manager influence your salary and/or promotion recommendations?"	.80
FMINFLU6	"How much does your Functional Manager influence your work hours?"	.86
FMINFLU7	"How much does your Functional Manager influence the setting of deadlines for your project work?"	.77

Based on the item analyses (reliability analysis and factor analysis), described in the present section, revised measurement scales were constructed. The single factor solutions reported in Tables 9 through 22 are taken as unidimensional, multi-item representations of each construct. A summary of the internal consistency reliability analysis for each of the revised scales is shown in Table 23.

Table 23

Summary of Reliability Analysis:
Internal Consistencies of Revised Scales

SCALE	SCALE NAME	NUMBER OF ITEMS	ITEMS	COEFF ALPHA	STANDARD ITEM ALPHA
Project Manager's Reward Power	PMREWARD	6	repm1 - repm6	.905	.907
Project Manager's Coercive Power	PMCOERCE	6	copm1, copm2, copm4 - copm7	.924	.926
Project Manager's Legitimate Power	PMLEGIT	6	lepm1 - lepm6	.767	.784
Project Manager's Expert Power	PMEXPERT	5	expm1 - expm5	.841	.846
Project Manager's Referent Power	PMREFER	6	rfpm1 - rfpm6	.853	.873
Functional Manager's Reward Power	FMREWARD	6	refm1 - refm6	.905	.909
Functional Manager's Coercive Power	FMCOERCE	6	cofm1, cofm2, cofm4 - cofm7	.953	.954
Functional Manager's Legitimate Power	FMLEGIT	6	lefm1 - lefm6	.942	.946
Functional Manager's Expert Power	FMEXPERT	5	exfm1 - exfm5	.896	.897
Functional Manager's Referent Power	FMREFER	6	rffm1 - rffm6	.938	.938

Table 23 -- Continued

SCALE	SCALE NAME	NUMBER OF ITEMS	ITEMS	COEFF ALPHA	STANDARD ITEM ALPHA
Project Manager's Effectiveness	PMEFFECT	5	pmeff1-pmeff7	.927	.930
Functional Manager's Effectiveness	FMEFFECT	5	fmeff1-fmeff7	.956	.959
Project Manager's Overall Influence	PMINFLUE	7	pminflu 1 - 7	.839	.835
Functional Manager's Overall Influence	FMINFLUE	7	fminflu 1 - 7	.884	.886

Overall, reliability and dimensionality of the revised scales were considered very satisfactory. A set of highly reliable, unidimensional scales for each construct had emerged. At this point, the revised scales were given labels to be used throughout the empirical analysis. Labels are shown in Table 23, as well as subsequent exhibits.

Trait validity was further substantiated by investigating the convergent validity as well as the discriminant validity of the revised scales. The measurement scales were assessed by a principal axes factoring, and the extracted factors were rotated using the Varimax method.

The results of the factor analysis over all items constituting all variables are reported in Appendix C, Table 48. The matrix shown is the varimax rotated factor loadings matrix contains fourteen factors and accounts for 74.4 of the total variance.

In general, the factor analysis reported in Appendix C, Table 48 provided considerable evidence of both convergent and discriminant validity. The first factor extracted clearly reflected the functional manager's coercive power with heavy loadings (exceeding .75) on all six items constituting the revised FMCOERCE scale. The second factor reflected the functional manager's legitimate power. Loadings on all six items constituting the FMLEGIT scale exceeded 0.75. The third factor extracted cleanly captured the functional manager's referent power. Loadings on the six items constituting the FMREFER scale were in the .63 to .84 range.

The fourth factor emerged as a factor capturing the functional manager's effectiveness rating with heavy loadings (greater than .81) on all five items constituting the FMEFFECT scale. Similarly, the fifth factor reflected the project manager's coercive power (PMCOERCE scale) with loadings on the six items ranging between .73 and .92. The sixth factor captured the project manager's effectiveness rating. Loadings on all five items comprising the PMEFFECT scale exceeded .74.

The seventh factor reflected the project manager's reward power with heavy loadings (exceeding .73) on all six items of the PMREWARD scale. Similarly, the eighth factor captured the functional manager's

perceived influence. Loadings for the FMINFLUE scale were in the .61 to .80 range. The project manager's referent power was evident as the ninth factor. All loadings for the PMREFER scale exceeded .58.

The project manager's perceived influence was captured by the tenth factor with loadings exceeding .58 for the seven PMINFLUE scale items. The functional manager's expert and reward powers were distinctly extracted by the eleventh and twelfth factors respectively. The loadings for the revised five item FMEXPERT scale all exceeded .66, while the six item FMREWARD scale loadings were in the .56 - .76 range.

The final two factors extracted were the project manager's expert and legitimate powers, respectively. The five items comprising the revised PMEXPERT scale all loaded in the .71 to .79 range. The PMLEGIT scale also displayed heavy loadings (exceeding .63) for all six of its scale items.

Overall, trait validity was clearly substantiated by the analysis reported in this section. Thus, the empirical analysis of the research hypotheses could proceed with highly reliable, unidimensional scales of multiple items for each construct, all of which exhibited significantly high convergent and discriminant validity.

Nomological Validity

Nomological (lawlike) validation entails investigating the empirical relationship between measures of constructs that, according to theory, are related. In the present study, the nomological validity of the constructs was assessed by computing the intercorrelations between variables.

A simple sum of scores of those items constituting the revised scale items for each construct, cf. Tables 9 through 22, was computed and, subsequently, used as a measure of that construct.

According to hypotheses derived from French and Raven's theory of social power (cf. the discussion of this theory in Chapter II) each of the five bases of power are expected to be independent constructs of one another. Thus, there should be near-zero or very weak relationships among each of the bases of power. In addition, matrix management theory suggests that a project manager's perceived effectiveness should be positively associated with his/her use of referent and expert power (personal power). By contrast, a functional manager's use of his/her reward, coercive, and legitimate powers (position power) and perceived managerial effectiveness are expected to be positively associated.

The expected relationships described in the previous paragraph are indeed primary suppositions of this research and are already represented by separate hypotheses to be tested explicitly (cf., hypotheses 1.1, 1.2, 2.3, 2.4, 2.5, 2.6, and 2.7 presented in Chapter

1). This illustrates that the distinction between construct validation in terms of nomological validation and theory validation based on theory testing is not particularly clear. In fact, Cronbach and Meehl state that "the investigation of a test's construct validity is not essentially different than the general scientific procedures for developing and confirming theories" (Cronbach and Meehl, 1955:300). Thus, nomological validation could be considered as an integral part of the subsequent testing of hypotheses. However, the results of the correlation analysis involving the hypothesized associations, are reported in Tables 24 and 25.

Table 24 shows the correlational matrix of the project manager's bases of power and his/her perceived subordinate effectiveness rating. The intercorrelations among the five bases of power support the conclusion that each source of power for the project manager is independent. All of the power scales show near-zero correlations among each other. Table 24 also reports that a project manager's effectiveness is positively correlated with his/her use of referent and expert power. Thus, the correlation analysis provides clear evidence of nomological validity.

In contrast with the project manager's scales, Table 25 reports that the functional manager's bases of power are not independent. The functional manager's position power is composed of positively related reward, coercive, and legitimate powers. Similarly, the functional manager's personal power is composed of positively related

Table 24

Project Manager's Bases of Power and Effectiveness:
Simple Pearson Correlations

	REWARD	COERCIVE	LEGITIMATE	EXPERT	REFERENT	PMEFFECT
REWARD	1.000					
COERCIVE	-.172*	1.000				
LEGITIMATE	.027	.046	1.000			
EXPERT	-.157*	-.041	.035	1.000		
REFERENT	-.112	-.029	-.082	.051	1.000	
PMEFFECT	-.074	-.064	.011	.800**	.770**	1.000

* p < .05

** p < .01

(n=136)

Table 25

Functional Manager's Bases of Power and Effectiveness:
Simple Pearson Correlations

	REWARD	COERCIVE	LEGITIMATE	EXPERT	REFERENT	FMEFFECT
REWARD	1.000					
COERCIVE	.602**	1.000				
LEGITIMATE	.485**	.339**	1.000			
EXPERT	-.259**	-.376**	-.147*	1.000		
REFERENT	-.491**	-.641**	-.258**	.560**	1.000	
FMEFFECT	.594**	.564**	.622**	-.194**	-.421**	1.000

* p < .05 ** p < .01 (n=133)

expert and referent powers. Thus, the correlation analysis did not provide evidence of nomological validity as far as the independence of the bases of power is concerned. However, the fact that a functional manager's position and personal power are inversely related accords with theory and provides support for the nomological validity of the functional manager's power scales. In addition, Table 25 reports that a functional manager's effectiveness is positively related with his/her reward, coercive, and legitimate power. Therefore, the correlational analysis does provide strong evidence of nomological validity for the functional manager's effectiveness scale and some support for the power scales.

Summary of Construct Validation

This completes the first step in analyzing the research data empirically. The objective of the empirical analysis was to investigate the validity of the constructs which were measured. Construct validity was distinguished between trait and nomological validity. Trait validation included the investigation of measurement scale reliabilities, convergent validity, discriminant validity, and the dimensionality of the measurement scales, while nomological validation was based on the investigation of constructs and measures in terms of hypotheses derived from theory.

Overall, the internal consistency reliabilities of the initial measures were satisfactory. Also, a series of factor analyses provided

considerable evidence of both convergent and discriminant validity. As part of the trait validation, scale purification was accomplished by performing item analyses. Employing reliability analysis and factor analysis, highly reliable, unidimensional scales of multiple items were constructed for each variable. Highly satisfactory reliability and dimensionality of the revised scales were demonstrated.

In the previous section of this chapter, the nomological validity of variables was assessed by investigating the intercorrelations between measures. Some minor deficiencies were observed, but generally speaking, the correlational analyses provided strong evidence of nomological validity for the variables examined.

Great care was taken to design the measurement scales reported in this study. The results presented in this chapter offer the first empirical evidence for the construct validity of the power measures. The use of multiple items for each power base in this questionnaire is an innovation from previous field research. Prior scales have ignored the possibility that each construct's domain may have been inadequately sampled; the present results indicate that the behavioral content of each power base is more complex. The power scales presented here will allow future researchers to minimize the impact of such confounds as social desirability and the attributional biases surrounding compliance. The scales can be easily adjusted for use by managers to describe their own behaviors, or for use by an independent third party. Moreover, the improved measurement capabilities should help researchers

conceptually by allowing more complex, multivariate data analyses and by leading them to look at the use of social power as a complex process, one affecting many group outcomes.

V. EMPIRICAL ANALYSIS: HYPOTHESES TESTING

Introduction

This chapter presents the results of the application of the methodologies described in Chapter III. These results were analyzed to determine the significant factors affecting the balance of power between project and functional managers in matrixed system program offices (SPOs). First, however, the sample population will be characterized by a number of summary descriptive statistics in order to gain some familiarity with the final survey respondents. The source of these descriptive statistics is responses to questionnaire items embedded in the background information portion (questions 1 - 14) of the main data collection instrument located in Appendix A.

Description of the Sample Population.

The target population of this thesis was matrixed personnel in Air Force Systems Command SPOs. The size of the target population was estimated to be around 8,000 SPO personnel (excluding laboratories) in all five of the product divisions: Aeronautical Systems Division, Wright-Patterson AFB OH; Ballistic Systems Division, Norton AFB CA; Electronic Systems Division, Hanscom AFB MA; Munitions Systems Division, Eglin AFB FL; and Space Systems Division, Los Angeles AFB, CA. As noted in Chapter III, the Air Force Military Personnel Center

placed a limit of 200 personnel on the sample size to be surveyed. Thus, only three SPOs were surveyed, all located at Wright-Patterson AFB OH within the Aeronautical Systems Division.

Of the 189 people surveyed, 136 (72.0 percent) returned completed questionnaires. This sample of 189 represent approximately 2.4 percent of the Air Force Systems Command population of SPO personnel. The questionnaire was distributed to the participants in mid June, 1989. Table 26 presents a summary of the mailing and response list showing that all three SPOs and their associated functional areas were represented by the final respondents. Examination of Table 26 indicates that the survey respondents are very representative of the sample in terms of SPO and functional work specialty¹. Only the Configuration Management Branch within the Advanced Cruise Missile SPO appears underrepresented.

¹ All responses are included in the tables. Varying totals are the result of missing data.

Table 26

Summary of Mailing and Response List of Survey Participants

<u>Advanced Cruise Missile SPO</u>			
<u>Work Specialty</u>	<u>Sent</u>	<u>Received</u>	<u>Percentage</u>
Engineering	21	12	57.1%
Test & Evaluation	4	1	25.0%
Program Control	9	7	77.8%
Config. Mgmt	9	1	11.1%
Contracting	9	7	77.8%
Logistics	17	12	70.6%
MFG/QA	11	9	81.8%
Other	<u>3</u>	<u>1</u>	<u>33.3%</u>
TOTAL	83	50	60.2%

<u>Lantirn SPO</u>			
<u>Work Specialty</u>	<u>Sent</u>	<u>Received</u>	<u>Percentage</u>
Engineering	17	15	88.2%
Test & Evaluation	9	7	77.8%
Program Control	6	5	83.3%
Contracting	6	5	83.3%
Logistics	8	6	75.0%
MFG/QA	<u>6</u>	<u>5</u>	<u>83.3%</u>
TOTAL	52	43	82.7%

<u>SRAM II SPO</u>			
<u>Work Specialty</u>	<u>Sent</u>	<u>Received</u>	<u>Percentage</u>
Engineering	22	18	81.8%
Test & Evaluation	3	2	66.7%
Program Control	11	9	81.8%
Config. Mgmt	5	4	80.0%
Contracting	2	2	100.0%
Logistics	8	6	75.0%
MFG/QA	<u>3</u>	<u>2</u>	<u>66.7%</u>
TOTAL	54	43	79.6%

OVERALL TOTALS	<u>189</u>	<u>136</u>	<u>72.0%</u>

For the total respondents (N = 136), 44 were engineers, 25 were logisticians, and 21 worked in program control (Appendix D, Table 48). Not surprisingly, almost 90 percent of the respondents were non-supervisors (Appendix D, Table 49). This result was planned into the sampling strategy because the objective was to measure power and influence from the viewpoint of the targets of influence -- subordinate project personnel.

The majority of the respondents (approximately 60%) were civilians (Appendix D, Table 50). Their General Schedule grades ranged from GS-5 to GS-14 with the modal grades a GS-12 or GS-13 (42 responses) (Appendix D, Table 51). The military respondents were overwhelmingly (approximately 83%) company grade officers (Appendix D, Table 52). The modal rank (N = 23) was Captain.

Tenure of respondents was measured by time with the Air Force in years, time in SPO in months, and time in present position in months. The mean time with the Air Force was between 4 years and 8 years. There were 76 of the respondents who had been with the Air Force over 8 years (Appendix D, Table 53). Tenure with the SPO had a mean of between 18 and 24 months, with 63 of the respondents in the same SPO for over 2 years (Appendix D, Table 54). Similarly, the mean time in the same job position was between 18 and 24 months, with 50 percent of the respondents working in the same position for over 2 years (Appendix D, Table 55).

An important consideration in this study was the length of time each respondent had worked with each of his/her functional and

project managers. Subordinants who had been supervised for a long period of time may have a more accurate perception of each of their manager's power than subordinates who had been in the relationship a short period of time. Tables 56 and 57 in Appendix D report the tenure (in months) of respondents with their functional and project managers. Subordinates were excluded from the final sample if their tenure with their managers was less than one month. Fortunately, this resulted in the deletion of only 2 responses. The mean and modal tenure times with each manager was between 18 and 24 months with over 75 percent of the respondees having worked with the same project and functional managers for over a year.

The average age of those responding was between 31 and 40 years with 63.2 percent of the respondees being over the age of 30 (Appendix D, Table 58). Almost all (97.1 percent) of the project personnel who responded had at least some college, with the average respondent holding a bachelor's degree. The modal education level was some graduate work (Appendix D, Table 59). Differentiation of the responding project personnel by their sex revealed that 107 were male and 29 were female (Appendix D, Table 60). Based on these averages, the sample population is represented by a composite individual of mature age who is a male, civilian engineer with a bachelor's degree (see Table 27 for specifics).

Table 27

Characterization of Sample Population

The sample population can be characterized by the averages of each of the demographic elements:

Job Title	Engineer
Number of personnel supervised	None
Military or Civilian	Civilian
Grade	GS-12/13
Tenure with Air Force	Over 8 years
Tenure with SPO	18-24 months
Tenure in position	18-24 months
Tenure with Functional Manager	18-24 months
Tenure with Project Manager	18-24 months
Age	31-40 years old
Education	Bachelor's Degree
Sex	Male

Test of Hypotheses and Related Findings

This section reports and discusses the empirical testing of the hypotheses advanced in Chapter I. First, hypotheses 1.1 and 1.2 concerning the independence of managerial power bases is tested employing simple correlational analyses. Second, hypotheses 2.1 through 2.6, examine the overall balance and use of power by the functional and project manager and are tested by descriptive statistics and statistical t-tests for significant differences in base-of-power reports. Next, hypotheses 3.1 through 3.9, explore the linkages between power, bases of power, and managerial effectiveness and are tested employing both multiple regression analyses and correlation analyses. Finally, hypotheses 4.1 and 4.2, constitute a set of propositions concerning the combination of various sources of power and are tested using multiple regression analyses. The revised scales presented in Chapter IV were used to test all of the hypotheses.

Investigative Question #1. Are the five bases of power, as theoretically described by French and Raven, orthogonal and distinct measures of social influence?

Investigative question #1 led to two hypotheses. Since managerial power is shared in a matrixed SPO between the project and functional managers, two separate managerial power indices were constructed. Both hypotheses had their roots in French and Raven's (1959) original study of social power, where the authors envisioned a distinct taxonomy of

power sources. Since it was theorized that there is little or no interaction among the bases of power, it was hypothesized that:

Hypothesis 1.1: A project manager's use of each of the five bases of power will be independent of the other power bases.

Hypothesis 1.1 was tested by simple correlation analysis. In testing the hypothesis, the revised scales PMREWARD, PMCOERCE, PMLEGIT, PMEXPERT, and PMREFER were utilized. Thus, each variable of interest was measured as the simple average of its six constituent items (except the PMEXPERT scale which has only five items (cf., the results of the scale purification procedure reported in Chapter IV). Table 28 reports the simple Pearson product-moment correlations of the revised project manager's bases of power scales. The intercorrelations among the five bases of power support the conclusion that each source of power for the project manager is independent. All of the power scales show near-zero correlations among each other. Thus, hypothesis 1.1 is supported. These results offer the first empirical support for the independence of the social power constructs. While it has long been assumed that these five power bases were separate behavioral categories, this assumption has only now been directly examined and verified by field research.

Hypothesis 1.2: A functional manager's use of each of the five bases of power will be independent of the other power bases.

Hypothesis 1.2 was tested in the same manner as hypothesis 1.1. Table 29 reports the correlations among the five power bases. In contrast with the project manager's power scales, the power bases of

Table 28

Intercorrelations for Project Manager's Bases of Power

	REWARD	COERCIVE	LEGITIMATE	EXPERT	REFERENT
REWARD	1.000				
COERCIVE	-.172*	1.000			
LEGITIMATE	.027	.046	1.000		
EXPERT	-.157*	-.041	.035	1.000	
REFERENT	-.112	-.029	-.082	.051	1.000

* p < .05

(n=136)

Table 29

Intercorrelations for Functional Manager's Bases of Power

	REWARD	COERCIVE	LEGITIMATE	EXPERT	REFERENT
REWARD	1.000				
COERCIVE	.602**	1.000			
LEGITIMATE	.485**	.339**	1.000		
EXPERT	-.259**	-.376**	-.147*	1.000	
REFERENT	-.491**	-.641**	-.258**	.560**	1.000

* p < .05

** p < .01

(n=133)

the functional manager show strong intercorrelations. Reward, coercive, and legitimate power (functions of position power) are highly and positively related to one another, as are referent and expert power (functions of personal power). In addition, the functional manager's position powers are strongly and negatively related with his/her personal powers. While not completely compatible with theory, these intercorrelations are consistent with the studies of Bachman et al. (1966), Bachman (1968), and others. These results suggest that the bases of power for the functional manager are not independent, i.e., a change in one power base may affect other power bases (Bass, 1981; Greene and Podsakoff, 1981). However, if a researcher wants to reduce the intercorrelations to zero, the composite varimax-rotated factor scales (see Chapter IV) may be computed (Rahim and Psenicka, 1984). To construct complete estimation factor scales, all items that have substantial loadings on a given factor are utilized, standardized and weighted by their respective factor-score coefficients (Harmon, 1976). The complete estimation method utilizes the following formula in computing a scale (Nie et al., 1975):

$$F_i = fsc_{1i}z_1 + fsc_{2i}z_2 + \dots + fsc_{ni}z_n$$

where,

F_i is the factor scale for the i^{th} factor,

fsc_{ji} is the factor-score coefficient for the i^{th} variable and j^{th} factor, and

z_j is the standardized value of the i^{th} variable

One of the advantages of the factor scaling method is that it creates scales which are orthogonal. Since it was shown in Chapter IV that the functional manager's bases of power loaded on distinct factors, separate, independent factor scale scores could be computed instead of the unweighted, simple average scales used in this study. However, the use of factor scales leads to numerous interpretability problems and become almost useless in providing feedback to organizational members who are unfamiliar with the more complex factor-scaling methods (Rahim and Psenicka, 1984). Thus, while support for hypothesis 1.2 is strong if weighted factor scales are used, the decision to use the convenient and interpretable simple average scales offers no support for the independence of the bases of power of the functional manager.

Investigative Question #2. In a matrixed SPO, what is the power spectrum and overall balance of power among project and functional managers as perceived by SPO personnel?

Organizational theorists have distinguished three different forms of matrix management structures in terms of the relative degree of power between project and functional managers (Galbraith, 1971; Larson and Gobeli, 1985, 1987a, 1987b; Vasconcellos, 1979; Vasconcellos and Hemsley, 1981; Youker, 1977). These three forms of matrix are usually put on a continuum which ranges from the functional matrix to the project matrix (Figure 6). For a given matrixed organization, one can determine where the power rests on the continuum for a number of factors such as who has the influence over work details and appraisal

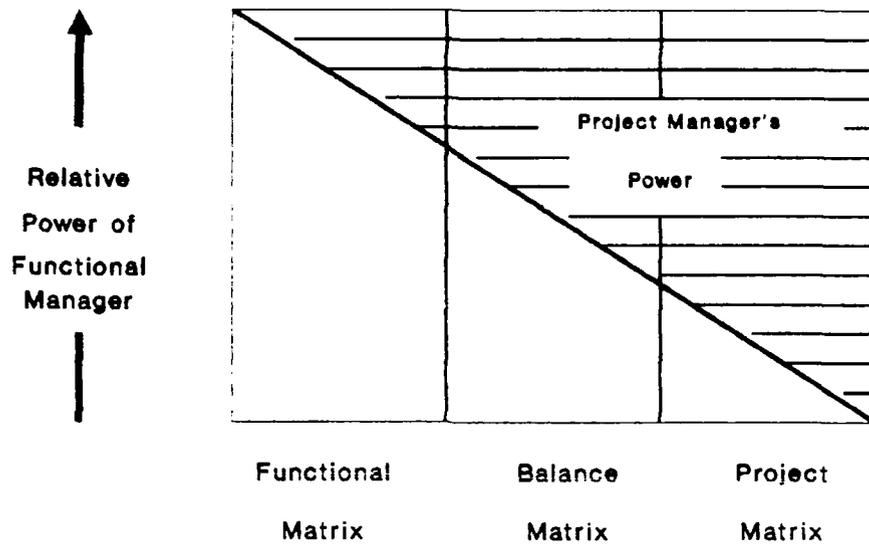


Figure 6. Three Matrix Structures

ratings. As noted in Chapter III, seven different job areas of potential influence were culled from the literature: technical details of project work, future work assignments, appraisal ratings, technical quality of project work, salary and/or promotions, work hours, and task deadlines. In any given organization, the power over some job factors will be strongly held by the functional manager and for some job factors the power will be held by the project manager. However, a composite score across all seven factors can be computed which indicates where the overall balance of power is located on the continuum in Figure 6.

Tables 61 through 67 in Appendix E report the frequency responses across each of the seven potential work areas of influence. Project personnel indicated that the functional manager has somewhat more influence than the project manager over the technical details of their project work, their future work assignments, and their project work hours. In addition, project personnel felt that the functional manager has even more influence over their appraisal ratings, technical quality of project work, and salary/promotion recommendations. Only when it comes to setting deadlines for their project work do the respondents feel that the project manager is at least as influential as their functional manager. Not surprisingly, when a composite score is made of all seven work influence variables (Appendix E, Table 68), the functional manager clearly has more power than the project manager. These results indicate that the functional matrix is the organizational form used in the surveyed SPOs. In line with this result, hypothesis 2.6 (concerning the overall balance of power issue) will be examined before hypotheses 2.1 through 2.5 (providing a set of hypotheses about the manager's bases of power) are addressed.

Hypothesis 2.6: A functional manager will be perceived as having more overall power than their project manager counterparts.

As a statistical check for verification and testing of hypothesis 2.6, simple t-tests were performed to establish that significant differences existed between the power of functional and project managers across the seven work areas of influence. Respondents were asked to separately evaluate the extent to which their project and functional managers influenced each area of their jobs (questions 58 - 71). However, for these sets of questions, the variables were operationalized in terms of intensity (from 1 "not at all" to 7 "to a very great extent") rather than a comparative approach used for questions 15 - 21. Because of this response design, consistency of responses can also be established.

Table 30 shows the results obtained when the functional and project managers are compared across each work area. The statistics in Table 30 provide strong evidence that among SPO personnel, the functional manager's influence over each of the seven work areas is greater than the project manager's influence. These results enhance the internal consistency of responses as well as confirming similar conclusions reached earlier (cf., analyses of frequency data presented in Appendix E). Thus, project personnel feel that functional managers have more influence over their jobs than project managers. The empirical data strongly supports hypothesis 2.6. This conclusion raises the question of whether the sources (or bases) of power used by each manager are significantly different.

Table 30

Comparison of Project and Functional Manager
Influence for All Respondents

Variable	N	Mean	Standard Deviation	Standard Error	T-Value	2-Tail Prob
PMINFLU1	135	3.511	1.398	.120	-6.87	.000
FMINFLU1		4.741	1.310	.113		

PMINFLU2	134	3.149	1.406	.121	-11.79	.000
FMINFLU2		5.313	1.265	.109		

PMINFLU3	134	2.313	1.800	.155	-17.86	.000
FMINFLU3		6.381	1.206	.104		

PMINFLU4	133	2.338	1.618	.140	-13.10	.000
FMINFLU4		5.744	1.782	.155		

PMINFLU5	134	1.978	1.719	.148	-18.19	.000
FMINFLU5		6.164	1.462	.126		

PMINFLU6	134	3.052	1.351	.117	-8.10	.000
FMINFLU6		4.642	1.601	.138		

PMINFLU7	134	3.769	1.511	.131	-4.97	.000
FMINFLU7		4.716	1.510	.130		

Hypothesis 2.1: A functional manager will be perceived as using more reward power than a project manager.

Hypothesis 2.2: A functional manager will be perceived as using more coercive power than a project manager.

Hypothesis 2.3: A functional manager will be perceived as using more legitimate power than a project manager.

Hypothesis 2.4: A project manager will be perceived as using more expert power than a functional manager.

Hypothesis 2.5: A project manager will be perceived as using more referent power than a functional manager.

Statistical tests for significant differences in base-of-power reports comparing project and functional managers are presented in Table 31. Functional managers have significantly greater reports on reward, coercive, and position power bases, while project managers use significantly greater expert and referent powers. Thus for the first time, we have empirical evidence that functional managers use more position power (reward, coercive, and legitimate) than their project manager counterparts. In contrast, project managers use more personal power (expert and referent) than functional managers. Thus, the field data provides strong support for all five hypotheses (2.1 - 2.5). There has been much personal speculation and anecdotal evidence that functional and project managers relied on separate bases of power. These results validate and support previous, intuitive conclusions concerning managerial power dynamics in matrixed SPOs. The next question addresses the perceived effectiveness of the power sources.

Table 31

Comparison of Project and Functional Manager
Bases of Power for All Respondents

Variable	N	Mean	Standard Deviation	Standard Error	T-Value	2-Tail Prob
PMREWARD		2.297	0.894	.078		
	130				-26.12	.000
FMREWARD		5.870	1.278	.112		

PMCOERCE		1.560	0.860	.075		
	132				-22.38	.000
FMCOERCE		4.512	1.346	.117		

PMLEGIT		2.951	0.573	.050		
	133				-28.03	.000
FMLEGIT		6.048	1.146	.099		

PMEXPERT		4.949	1.047	.091		
	133				11.64	.000
FMEXPERT		3.370	1.045	.091		

PMREFER		6.631	0.650	.056		
	134				31.02	.000
FMREFER		2.397	1.426	.123		

Investigative Question #3. What are the independent effects perceived by subordinates within a matrixed SPO of each of the five bases of power on the project and functional manager's overall power and managerial effectiveness?

To study this issue, several hypotheses were formed:

Hypothesis 3.1: Each of the project manager's sources of power is highly related to his/her overall power.

Hypothesis 3.2: Each of the functional manager's sources of power is highly related to his/her overall power.

These hypotheses were based, in part, on findings in the marketing literature (Brown and Frazier, 1978; Etgar, 1976b; Etgar, 1978; Gaski, 1984; Hunt and Nevin, 1974; Lusch and Brown, 1982; Wilkinson, 1974), where the sources of power in a marketing channel tended to be positively related to a channel member's overall power. Viewing a marketing channel as a social action system (Aldrich, 1979), it was expected that project and functional managers' power and sources of power would have similar relationships.

Hypotheses 3.1 and 3.2 were tested by simple correlation analysis using the revised managerial influence scales. Tables 32 and 33 report the Pearson product-moment correlations of the manager's bases of power and overall power. The project manager's bases of power display virtually no relation to his/her overall power as intercorrelations are essentially zero between these constructs. The correlation results for

Table 32

Project Manager's Power and Bases of Power Intercorrelations

	REWARD	COERCIVE	LEGITIMATE	EXPERT	REFERENT	PM INFLUENCE
REWARD	1.000					
COERCIVE	-.172*	1.000				
LEGITIMATE	.027	.046	1.000			
EXPERT	-.157*	-.041	.035	1.000		
REFERENT	-.112	-.029	-.082	.051	1.000	
PM INFLUENCE	-.003	.040	.013	-.071	-.108	1.000

* p < .05

(n=133)

Table 33

Functional Manager's Power and Bases of Power Intercorrelations

	REWARD	COERCIVE	LEGITIMATE	EXPERT	REFERENT	FM INFLUENCE
REWARD	1.000					
COERCIVE	.602**	1.000				
LEGITIMATE	.485**	.339**	1.000			
EXPERT	-.259**	-.376**	-.147*	1.000		
REFERENT	-.491**	-.641**	-.258**	.560**	1.000	
FM INFLUENCE	.302**	.106	.214**	.146*	.047	1.000

* p < .05

** p < .01

(n=133)

the functional manager's bases of power show that reward, legitimate, and expert powers are significantly related to overall power. However, the referent and coercive bases show virtually no correlations with overall power. On the whole, the data suggests that there is little support for either hypotheses 3.1 or 3.2. Further work is needed in developing an overall power index that captures the full range of a manager's potential power over subordinates in a matrix organization. A content analysis of the questions constituting the overall power scale was performed and revealed that most items concern organizational derived power (i.e., formal authority over work hours, appraisal ratings, etc.). In previous hypotheses, it was shown that the project manager primarily relies on power derived from sources outside of the organization. Thus, it is not surprising that a project manager's bases of power are not tapped by a power index based primarily on formal authority.

Hypotheses 3.3 through 3.9 refer to a manager's bases of power and perceived subordinate effectiveness evaluations. These hypotheses will be tested by simple and partial correlational analyses.

Hypothesis 3.3: A project manager perceived as using expert power will receive higher subordinate evaluations than a functional manager perceived as using expert power.

Hypothesis 3.4: A project manager perceived as using referent power will receive higher subordinate evaluations than a functional manager perceived as using referent power.

Hypothesis 3.5: A functional manager perceived as using reward power will receive higher subordinate evaluations than a project manager perceived as using reward power.

Hypothesis 3.6: A functional manager perceived as using coercive power will receive higher subordinate evaluations than a project manager perceived as using coercive power.

Hypothesis 3.7: A functional manager perceived as using legitimate power will receive higher subordinate evaluations than a project manager perceived as using legitimate power.

Initially, simple correlation analysis was employed to examine the propositions stated by hypotheses 3.3 through 3.7. The simple Pearson correlations are already reported in Tables 24 and 25 (pages 127-128). when the nomological validity of the revised scales was investigated. The correlation coefficients of particular interest to the present analysis are extracted and summarized in Table 34. The simple Pearson product-moment intercorrelations are all highly significant in the directions hypothesized. Thus, the zero-order correlations tend to support the hypotheses. However, we have two independent samples here, and are really interested in comparing the degree of relationship between managerial effectiveness and a power base within each sample. Blalock (1979:424) provides a statistical procedure for testing the difference between two correlations from two independent samples. The procedure is shown in Figure 7.

Table 34

Hypotheses 3.3 through 3.7:
Simple Pearson Correlations

Hypothesis	Variables	Correlation Coefficient
3.3	PMEFFECT, PMEXPERT	.800**
	FMEFFECT, FMEXPERT	-.194**

3.4	PMEFFECT, PMREFER	.770**
	FMEFFECT, FMREFER	-.421**

3.5	PMEFFECT, PMREWARD	-.074
	FMEFFECT, FMREWARD	.594**

3.6	PMEFFECT, PMCOERCE	-.064
	FMEFFECT, FMCOERCE	.564**

3.7	PMEFFECT, PMLEGIT	.011
	FMEFFECT, FMLEGIT	.622**

** p < .01

(n=133)

Let x = Effectiveness rating of the project/functional manager

Let y = The bases of power of the project manager (reward, coercive, legitimate, expert, referent)

Let z = The bases of power of the functional manager (reward, coercive, legitimate, expert, referent)

n = 136

The null hypothesis is:

$$H_0: r_{xy} = r_{xz}$$

$$H_a: r_{xy} > r_{xz}$$

Reject H_0 if $|Z| > 1.96$ (at alpha of .05)

where,

$$z = (1.151) \left(\log \frac{1+r}{1-r} \right)$$

$$\sigma_{z_1 - z_2} = \sqrt{\frac{1}{n_1 - 3} + \frac{1}{n_2 - 3}}$$

$$Z = \frac{(z_1 - z_2) - 0}{\sigma_{z_1 - z_2}}$$

Figure 7. Test for the Difference between Two Correlations from Independent Samples (Blalock, 1979)

The tests for each of the different power bases with perceived managerial effectiveness are presented in Table 35. In all five cases

Table 35

Calculations for Test of Difference between
Power Base and Managerial Effectiveness Correlations

Hypothesis 3.3: Expert Power and Managerial Effectiveness Differences

$$\begin{array}{lll}
 r_{pm} = .800 & z_{pm} = 1.0986 & \sigma_{z_{pm} - z_{fm}} = .1226 \\
 r_{fm} = -.194 & z_{fm} = -.1965 & (1.0986 + .1965) \\
 & & Z = \frac{\quad}{.1226} = 10.5636
 \end{array}$$

Hypothesis 3.4: Referent Power and Managerial Effectiveness Differences

$$\begin{array}{lll}
 r_{pm} = .770 & z_{pm} = 1.0203 & \sigma_{z_{pm} - z_{fm}} = .1226 \\
 r_{fm} = -.421 & z_{fm} = -.4489 & (1.0203 + .4489) \\
 & & Z = \frac{\quad}{.1226} = 11.9837
 \end{array}$$

Hypothesis 3.5: Reward Power and Managerial Effectiveness Differences

$$\begin{array}{lll}
 r_{pm} = -.074 & z_{pm} = -.0741 & \sigma_{z_{pm} - z_{fm}} = .1226 \\
 r_{fm} = .594 & z_{fm} = .6838 & (.6838 + .0741) \\
 & & Z = \frac{\quad}{.1226} = 6.1819
 \end{array}$$

Table 35 -- Continued

Hypothesis 3.6: Coercive Power and Managerial Effectiveness Differences

$$\begin{array}{lll}
 r_{pm} = -.064 & z_{pm} = -.0641 & \sigma_{z_{pm} - z_{fm}} = .1226 \\
 r_{fm} = .564 & z_{fm} = .6387 & Z = \frac{(.6387 + .0641)}{.1226} = 5.7325
 \end{array}$$

Hypothesis 3.7: Legitimate Power and Managerial Effectiveness Differences

$$\begin{array}{lll}
 r_{pm} = .011 & z_{pm} = .0110 & \sigma_{z_{pm} - z_{fm}} = .1226 \\
 r_{fm} = .622 & z_{fm} = .7283 & Z = \frac{(.7283 - .0110)}{.1226} = 5.8507
 \end{array}$$

the null hypotheses can be rejected. Rejection of H_0 indicates that the higher correlations of expert and referent power with project manager effectiveness, and the higher correlations of reward, coercive, and legitimate power with functional manager effectiveness are real differences between each manager and are not expected to have occurred by chance.

An additional method of determining the relative strength of the power bases with perceived managerial effectiveness is through the use

of partial correlation. As noted in Chapter II, researchers have not examined the independent relationships of the five bases of power with criterion variables; this has created substantial difficulties in interpreting research results. It has been shown that the power bases of the functional manager are not totally independent and that it is expected that managers of personnel will use at least a small degree of each power base (Bass, 1981). Thus, fourth-order partial correlation analyses will control for the other power bases and give a more accurate identification of the true independent relationships for each power base. Table 36 presents the results of the fourth-order partial correlations.

Table 36
Power Scale Fourth-Order Partial Correlations
with Managerial Effectiveness

<u>Power Base</u>	Project Manager's Effectiveness	Functional Manager's Effectiveness
Reward	.1109	.2181**
Coercive	-.0295	.2843**
Legitimate	.1565*	.4766**
Expert	.6061**	.0820
Referent	.4723**	-.0632

* p < .05 ** p < .01 (n=133)

The results of the partial correlation analyses agree, for the most part, with the results obtained from the zero-order correlations and the tests for differences between correlations. The project manager's effectiveness is highly related to his/her use of expert and referent power. A functional manager's use of reward, coercive and legitimate power is closely related to his/her perceived effectiveness. The only anomaly between the zero-order and fourth-order partial correlations is the project manager's use of legitimate power. Table 36 shows that the project manager's effectiveness is dependent upon his/her use of legitimate power. While the use of legitimate power is not nearly as significant as the project manager's use of expert and referent power (nor is it greater than the functional manager's use of legitimate power), the results are somewhat surprising. Perhaps the dichotomy between position and personal power for functional and project managers is not as strong as suggested in the literature. An effective project manager cannot solely rely on his personal power but may have to use legitimate power in motivating project personnel.

Overall, strong support is provided for hypotheses 3.3 through 3.7. The empirical data suggests that a project manager will be perceived by subordinates as being more effective than the functional manager if (s)he uses more expert and referent power than the functional manager. On the other hand, a functional manager using more reward, coercive, and legitimate power than a project manager will be perceived by project personnel as more effective. The strength of these relationships suggest that strong organizational norms have been

established in matrixed SPOs. Project personnel have role expectations of their project and functional managers; violation of those expectations could have negative consequences.

The final two hypotheses for investigative question #3 involve examinations of the difference between correlations in a single sample. Simple and partial correlation analyses were employed to examine the propositions stated in Hypotheses 3.8 and 3.9.

Hypothesis 3.8: A project manager's expert and referent powers are more highly related to leader effectiveness than his or her reward, coercive, or legitimate powers.

Hypothesis 3.9: A functional manager's reward, coercive, and legitimate powers are more highly related to leader effectiveness than either his/her referent or expert power.

The fourth-order partial correlations reported in Table 36 strongly support both hypotheses. The independent effects of a project manager's use of expert and referent powers is more highly related to his/her perceived effectiveness than the other three power bases. Likewise, the functional manager's use of reward, coercive, and legitimate powers are more highly related to managerial effectiveness than his/her use of personal power (expert and referent).

In addition to the partial correlation analysis, Blalock (1979: 425) provides a statistical procedure for establishing which of two related variables is more highly related to a third variable. The procedure is shown in Figure 8.

Let x = Effectiveness rating of the project/functional manager

Let y = One base of power of the project/functional manager
(either reward, coercive, legitimate, expert, or referent)

Let z = A different base of power of the project/functional manager

n = 136

The null hypothesis is:

$$H_0: r_{xy} = r_{xz} \qquad H_a: r_{xy} > r_{xz}$$

Reject H_0 if $|t_0| > 1.65$ (at alpha = .05)

where,

$$t_0 = (r_{xy} - r_{xz}) \sqrt{\frac{(n-3)(1 + r_{yz})}{2(1 - r_{xy}^2 - r_{yz}^2 - r_{xz}^2 + 2r_{xy}r_{yz}r_{xz})}}$$

Figure 8. T-test for Comparison of Pearson Correlation Coefficients (Blalock, 1979)

Table 37 presents the results of the various t-tests comparing zero-order correlation coefficients. These results indicate that the null hypotheses can be rejected in all cases. For the project manager, rejection of H_0 indicates that when the effects of the moderating variables (reward, coercive, legitimate powers) are controlled, expert and referent powers are clearly the better indicators of managerial effectiveness. Similarly, when a functional manager's expert and

Table 37

Calculations of T-tests for Zero-Order Correlations
between Managerial Effectiveness and Power Bases

Project Manager Effectiveness:

Expert vs. Reward	$t_o = 11.0852^{**}$
Expert vs. Coercive	$t_o = 11.5253^{**}$
Expert vs. Legitimate	$t_o = 10.8839^{**}$
Referent vs. Reward	$t_o = 10.2306^{**}$
Referent vs. Coercive	$t_o = 10.5294^{**}$
Referent vs. Legitimate	$t_o = 9.3567^{**}$

Functional Manager Effectiveness:

Reward vs. Expert	$t_o = 7.1281^{**}$
Reward vs. Referent	$t_o = 8.1422^{**}$
Coercive vs. Expert	$t_o = 6.3829^{**}$
Coercive vs. Referent	$t_o = 7.6268^{**}$
Legitimate vs. Expert	$t_o = 8.0052^{**}$
Legitimate vs. Referent	$t_o = 10.3160^{**}$

** $p < .01$

($n=133$)

referent power are controlled, his/her reward, coercive, and legitimate powers are better indicators of managerial effectiveness. Thus, the empirical data strongly support hypotheses 3.8 and 3.9.

Investigative Question #4: Because power can come from several sources, what are the results of combining sources?

This question has seldom been addressed in theories of power. French and Raven theorized that sources of power are additive in that each new source adds to a person's accumulated power. However, it is possible that some combinations of power may be synergistic, in that they create disproportionate increases in total power. Numerous joint effects of power bases with other criterion variables could also be examined. Because this is an exploratory study, it was decided to empirically test only two possibilities. Thus, the first hypothesis was:

Hypothesis 4.1: A project manager's combination of expert and referent powers are more highly related to managerial effectiveness than either of these sources of power alone.

Simple linear and multiple regression analysis was employed to examine this proposition. Initially, two simple linear regression models were developed using the project manager's expert and referent power sources as independent variables and his/her perceived managerial effectiveness as the dependent variable. The results of these two regression analyses are reported in Table 38 and 39. Simple linear regression analyses of the other three power bases are reported in Appendix F. The empirical data shows that both expert and referent powers are highly significant in explaining a project manager's

Table 38

Simple Linear Regression of Project Manager Effectiveness with Expert Power

Dependent Variable: Project Manager Effectiveness Independent Variable: Project Manager's Expert Power					
Multiple R	.80027			F = 236.89140	
R Square	.64044			Signif F = .0000	
Adjusted R Square	.63773				
Standard Error	.42623				
Variables in Equation					
Variable	B	SE B	Beta	t	Sig t
PMEXPERT	.544551	.035380	-.800274	15.391	.0000
(Constant)	2.476286	.178818	---	13.848	.0000

Table 39

Simple Linear Regression of Project Manager Effectiveness with Referent Power

Dependent Variable: Project Manager Effectiveness Independent Variable: Project Manager's Referent Power					
Multiple R	.77014			F = 193.86931	
R Square	.59311			Signif F = .0000	
Adjusted R Square	.59005				
Standard Error	.45342				
Variables in Equation					
Variable	B	SE B	Beta	t	Sig t
PMREFER	.842951	.060541	.770136	13.924	.0000
(Constant)	-.418456	.403256	---	-1.038	.3013

perceived effectiveness. Expert power independently explains 63.8% of the variance, while referent power independently explains 59.0%. The next step is to assess the overall model performance when both variables are entered. Table 40 reports the multiple regression analysis when both a project manager's expert and referent powers are used to explain his/her overall perceived managerial effectiveness.

Table 40

Multiple Regression of Project Manager Effectiveness
with Expert and Referent Powers

Dependent Variable: Project Manager Effectiveness
Independent Variable: Project Manager's Expert & Referent Powers

Multiple R	.85595	R SQUARE CHANGE	.09220
R Square	.72264	F CHANGE	45.52307
Adjusted R Square	.72859	SIGNIF F CHANGE	.00000
Standard Error	.36893		

F = 180.86012
Signif F = .0000

Variables in Equation

Variable	B	SE B	Beta	t	Sig t
PMEXPERT	.349523	.042111	.513660	8.436	.0000
PMREFER	.457034	.067738	.417554	5.916	.0000
(Constant)	.411062	.342999	---	1.723	.0873

Together, these two power bases explain 72.0% of the variance in project manager effectiveness. The increase in R-square of .09 was significant ($p < .0000$) and the adjusted R-square was maximized when only expert and referent power were included in the model (analysis of all possible regression models with the project manager's five bases of power). Thus, the combination of expert and referent power (with beta values of .51 and .42, respectively), are more highly related to the project manager's perceived effectiveness than either one of these power bases alone. Hypothesis 4.1 is supported by the empirical evidence.

The second hypothesis for investigative question #4 concerns the functional manager's perceived effectiveness.

Hypothesis 4.2: A functional manager's combination of legitimate, reward, and coercive powers are more highly related to managerial effectiveness than either of these sources of power used alone or in pairs.

Simple linear regression and multiple regression analyses were used to test this hypothesis. As was done for hypothesis 4.1, simple linear regression models were developed to compare the independent effects of a functional manager's reward, coercive, and legitimate powers in explaining his/her overall managerial effectiveness. Tables 41 through 43 present the three simple linear models. The empirical data shows that all three power bases are highly significant in explaining a functional manager's perceived effectiveness. Reward

Table 41

Simple Linear Regression of Functional Manager
Effectiveness with Reward Power

Dependent Variable: Functional Manager Effectiveness		Independent Variable: Functional Manager's Reward Power			
Multiple R	.59392	F = 71.39097			
R Square	.35274	Signif F = .0000			
Adjusted R Square	.34780				
Standard Error	1.13482				
Variables in Equation					
Variable	B	SE B	Beta	t	Sig t
FMREWARD	.655460	.077575	.593917	8.449	.0000
(Constant)	.365843	.465721	---	.786	.4336

Table 42

Simple Linear Regression of Functional Manager
Effectiveness with Coercive Power

Dependent Variable: Functional Manager Effectiveness		Independent Variable: Functional Manager's Coercive Power			
Multiple R	.56432	F = 61.21230			
R Square	.31846	Signif F = .0000			
Adjusted R Square	.31326				
Standard Error	1.16790				
Variables in Equation					
Variable	B	B	Beta	t	Sig t
FMCOERCE	.583408	.074568	.564324	7.824	.0000
(Constant)	1.595936	.349834	---	4.562	.0000

Table 43

Simple Linear Regression of Functional Manager
Effectiveness with Legitimate Power

Dependent Variable: Functional Manager Effectiveness Independent Variable: Functional Manager's Legitimate Power					
Multiple R	.62173			F = 83.17574	
R Square	.38655			Signif F = .0000	
Adjusted R Square	.38190				
Standard Error	1.10727				
Variables in Equation					
Variable	B	SE B	Beta	t	Sig t
FMLEGIT	.764865	.083866	.621730	9.120	.0000
(Constant)	-.394641	.515528	---	-.766	.4453

power explained 34.8% of the variance when used alone. Coercive power explained 31.3% of the variance, while legitimate power explained 38.2%

Multiple regression analyses were employed next to examine the joint effects of the power bases as well as the effects of all three powers combined together. Tables 44 through 46 report the joint effects of the three power bases; Table 47 reports the combined multiple regression model employing all three power bases.

Table 44

Multiple Regression of Functional Manager Effectiveness
with Reward and Coercive Powers

Dependent Variable: Functional Manager Effectiveness					
Independent Variable: Functional Manager's Reward & Coercive Powers					
Multiple R	.64717		R SQUARE CHANGE	.05325	
R Square	.41884		F CHANGE	20.43121	
Adjusted R Square	.40983		SIGNIF F CHANGE	.00090	
Standard Error	1.08014				
F = 46.48404					
Signif F = .0000					

Variables in Equation

Variable	B	SE B	Beta	t	Sig t
FMREWARD	.434146	.092705	.393458	4.683	.0000
FMCOERCE	.338167	.086342	.329060	3.917	.0001
(Constant)	.140684	.448164	---	.314	.7541

Table 45

Multiple Regression of Functional Manager Effectiveness
with Reward and Legitimate Powers

Dependent Variable: Functional Manager Effectiveness					
Independent Variable: Functional Manager's Reward & Legitimate Powers					
Multiple R	.70426		R SQUARE CHANGE	.11034	
R Square	.49598		F CHANGE	28.56120	
Adjusted R Square	.48822		SIGNIF F CHANGE	.00000	
Standard Error	1.00525				
F = 63.96285					
Signif F = .0000					

Variables in Equation

Variable	B	SE B	Beta	t	Sig t
FMREWARD	.423692	.078588	.383911	5.391	.0000
FMLEGIT	.530682	.087308	.432832	6.078	.0000
(Constant)	-1.475810	.511857	---	-2.883	.0046

Table 46

Multiple Regression of Functional Manager Effectiveness
with Coercive and Legitimate Powers

Dependent Variable: Functional Manager Effectiveness

Independent Variable: Functional Manager's Coercive & Legitimate Powers

Multiple R	.72437	R SQUARE CHANGE	.14360
R Square	.52471	F CHANGE	38.97428
Adjusted R Square	.51734	SIGNIF F CHANGE	.00000
Standard Error	.97680		

F = 71.20745
Signif F = .0000

Variables in Equation

Variable	B	SE B	Beta	t	Sig t
FMCOERCE	.413917	.066302	.402770	6.243	.0000
FMLEGIT	.588778	.078994	.480866	7.453	.0000
(Constant)	-1.204070	.475854	---	-2.530	.0126

Table 47

Multiple Regression of Functional Manager Effectiveness
with Reward, Coercive and Legitimate Powers

Dependent Variable: Functional Manager Effectiveness
Independent Variable: Funct Mgr's Reward, Coercive & Legitimate Powers

Multiple R	.74133	R SQUARE CHANGE	.02486
R Square	.54957	F CHANGE	7.06384
Adjusted R Square	.53901	SIGNIF F CHANGE	.00890
Standard Error	.95462		

F = 52.05772
Signif F = .0000

Variables in Equation

Variable	B	SE B	Beta	t	Sig t
FMREWARD	.234513	.088236	.212535	2.658	.0089
FMCOERCE	.305873	.076492	.297636	3.999	.0001
FMLEGIT	.506757	.083140	.413878	6.095	.0000
(Constant)	-1.598891	.488199	---	-3.275	.0014

The results from the joint effects multiple regression models show that reward (beta = .39) and coercive (beta = .33) powers together explain 41.0% of the functional manager's effectiveness rating. The change in R-square of .05 is significant ($p < .0009$). The joint effects of reward power (beta = .38) and legitimate power (beta = .43) explain 48.8% of the functional manager's perceived effectiveness. The resultant change in R-square when legitimate power was entered into the model was .11 ($p < .0000$). Finally, the combined effects of

coercive power (beta = .40) and legitimate power (beta = .48) explain 51.7% of the variance in the functional manager's effectiveness. An R-square change of .14 ($p < .0000$), the highest among combinations of two power bases, suggests that legitimate and coercive power is the relatively best two factor model. However, by combining all three power bases, reward (beta = .21), coercive (beta = .30), and legitimate power (beta = .41), slightly more of the functional manager's effectiveness rating is explained. The three power bases combine to explain 53.9% of the variance. The change in R-square was a significant ($p < .0089$) increase of .025. An analysis of all possible regression models using the functional manager's five bases of power revealed that adjusted R-square was maximized when reward, coercive, and legitimate powers are used to explain the functional manager's perceived effectiveness.

A model that explains only a little more than half of the variance of the dependent variable may be perceived as a poor choice, but in exploratory research such a model is quite satisfactory (Kerlinger, 1986; Nunnally, 1978). In fact, adding either expert or referent power to the model would decrease the adjusted R-square. Thus, the final model with reward, coercive, and legitimate powers as the independent variables is the best for the data in this study. In conclusion, the multiple regression analyses support hypothesis 4.2.

Empirical Testing: Summary of Findings

This chapter contained the results of the hypotheses testing and some of the major results from the research. Generally speaking, the empirical analysis provided relatively strong support for the major suppositions tested in this study.

First, the power bases of the project manager were shown to be separate behavioral categories -- the first empirical evidence for the independence of the social power constructs. While the functional manager's power bases were not independent using a simple average scale, Chapter IV showed that, if a researcher desired zero intercorrelations, (s)he may use a composite factor scale.

Second, all of the hypotheses associated with research question #2 were empirically supported. Functional managers were perceived by project personnel as using more reward, coercive, and legitimate powers than their project manager counterparts. Likewise, project managers were shown to use more expert and referent power than their functional colleagues. In addition, the functional manager is perceived to have more overall power than the project manager in matrixed SPOs. This suggests that the three matrix organizations surveyed in this study can be described as functional matrix organizations. Recent research (Larson and Gobeli, 1985; Larson and Gobeli, 1987a; Larson and Gobeli, 1987b) reports that the functional matrix is the least effective of the two other matrix forms (balance and project). Future research needs to be done in this area.

For the most part, the hypotheses associated with investigative question #3 were supported. Project managers are perceived as being more effective than functional managers if they use more expert or referent power. Functional managers are rated more effective than their project manager counterparts if they use more reward, coercive, and legitimate power. The empirical evidence suggests that strong organization norms and role expectancies have been established in matrixed SPOs for both the functional and project manager. A manager who deviates from these role expectations may experience negative consequences (i.e., be perceived as being an ineffective manager). Not surprisingly, a project manager's use of expert and referent powers is more highly related to his perceived effectiveness than either of his/her other power bases. Results were similar for the project manager's use of reward, coercive, and legitimate powers in comparison with his/her other two bases of power. The only hypotheses not empirically supported are the near-zero correlations found between a manager's bases of power and his/her overall power. This finding is especially true for the project manager. Suggestions were made that these results were due to a biased power index that measures primarily organizational derived power. The overall power index is an area that needs to be further analyzed in future studies.

Finally, hypotheses 4.1 and 4.2 employed multiple regression analyses techniques in showing that the combination of a project manager's expert and referent powers better explains his/her perceived effectiveness rating than any of the powers alone. Thus, an effective

project manager needs to use both power bases in motivating project personnel. Similarly, the empirical data suggests that the functional manager should rely on using all three position powers available.

This completes the statistical testing of hypotheses. In the next chapter of the thesis, the implications and the limitations of the research are elaborated, and suggestions for future research in this area are provided.

VI. Discussion: Implications and Limitations

Introduction

Power is a central concern of most employees (Gioia and Sims, 1983). According to McClelland and Burnham (1976), acquiring and maintaining power is one of the most socially motivating processes that occurs in organizations. Although power has been examined by researchers from a wide variety of perspectives, the social power theory originally proposed by French and Raven (1959), has been the most popular and influential. French and Raven's power taxonomy, consisting of reward, coercive, legitimate, expert and referent power is one of social psychology's major contributions to the study of leadership and social influence in groups and organizations (Cobb, 1980; Mintzberg, 1983; Yukl, 1989a). Unfortunately, although the power bases described in social power theory have been widely tested in both field and laboratory settings (Collins and Raven, 1969; Raven and Kruglanski, 1970), they suffer from a number of methodological problems (see Chapter II). More than most of their contemporaries, project and functional managers in matrixed organizations find themselves in situations involving power and influence. After all, the matrix is perhaps the only organization form in which power over a subordinate is shared. Thus, to do their jobs effectively, project and functional managers need to understand the nature of power and influence in matrix

organizations. Research is therefore needed to identify the obstacles and opportunities for the effective use of power by project and functional managers.

The purpose of this final chapter is to discuss implications and limitations of the present research. First, theoretical implications of the study are elaborated. These implications derive from the results reported in the previous chapter. Next, managerial implications are discussed. Despite the fact that this study is theory application research rather than effects applications research (see discussion on pages 79-80), it is felt that managerial implications and contributions should be a primary concern of any thesis research study in the business and management areas. Finally, methodological contributions and shortcomings are explained. The balance of the chapter provides suggestions for future research in the social power substantive research area. Among other suggestions, the need for a cumulative tradition in this area is emphasized.

Theoretical Implications: A Review of Research Findings

From a theoretical standpoint, this study provides strong evidence for using French and Raven's social power theory as a coherent framework within which managerial power can be understood, explained, and predicted. As noted in Chapter II, researchers have abandoned French and Raven's power taxonomy for the last nine years due to inconsistent and contradictory results obtained from field studies. However, most of these problems resulted from a lack of sufficiently

valid and reliable operational definitions for each power base. The scales developed and tested in this study strongly indicate that the five power bases (i.e., reward, coercive, legitimate, expert, and referent) are distinct factors and do indeed stand as valid constructs of the social influence process.

Other researchers have offered criticisms of French and Raven's theory. Kipnis and Schmidt (1983) noted:

They [French and Raven] blur the distinction between "resources controlled," which provides the potential for exercising influence, and the actual influential tactics used. . . . It may be that there is little relationship between the nature of the resources controlled and the tactics used (Kipnis and Schmidt, 1983: 305).

This study addressed Kipnis and Schmidt's concern by analyzing reports of actual, rather than potential, influence attempts while still remaining within the French and Raven typology of socially dependent bases of power. Most recently, Yukl pointed out that:

Research on [French and Raven's] power typology has floundered on the issue of measurement . . . Until this measurement problem is solved, not much progress is likely in research on the implications of different types of power for leader effectiveness (Yukl 1989b:255).

One of the main objectives of this study was to respond to Yukl's measurement concern (plus others discovered in the review of the relevant literature). Chapter III established the methodology used to tackle these measurement problems and Chapter IV presented the results of the construct validation process. While the process of construct-validating any measure is one that never ends (Nunnally, 1978; Schwab,

1980), the psychometric adequacy of the power scales developed for this study was excellent.

In general, the analyses reported in the previous chapters provide relatively strong support for the French and Raven power taxonomy as well as the theory of power in matrix organizations.

Managerial Implications and Limitations

A potential contribution of this study is to provide project and functional managers with a better understanding of the influence processes available to them in motivating project personnel. In particular, the results of the study may help managers improve their understanding of how various power bases may be used to affect their perceived effectiveness and overall power in matrixed SPOs.

Without question, personnel management is more complex in matrix organizations than in conventional forms of management. Project managers have to deal effectively with a variety of interfaces and support personnel over whom they have little or no formal authority. On the other hand, functional managers must work in an environment in which their power and influence over subordinates is shared with their project manager counterparts. It is this interplay of the various personal, organizational, managerial and technical factors that determines the level of productivity in the project office. To function effectively, the project and functional managers must understand the interrelationship of these factors and, most important, must realize that the work is being performed by people whose personal

efforts, ingenuity, and commitment shape the project according to established plans.

As viewed from below by project personnel, effective project and functional managers need to understand the interaction of organizational and behavioral elements in order to build an environment conducive to their teams' motivational needs.

Project managers must cross functional lines to get the required support. Almost invariably, the project manager must build multidisciplinary teams into cohesive groups and deal successfully with a variety of interfaces, such as functional departments, staff groups, team members, clients, and senior management. Furthermore, the project manager must often operate in areas with little or no formal authority. In contrast to functional managers who are provided position power largely in the form of legitimate authority, project managers derive their power mostly from within: the power that comes from expertise, credibility, and charisma. A major characteristic of the project manager's position is that (s)he always has more responsibility than authority. This imbalance is much more significant in the case of the project manager than other management positions and it is a clear violation of the parity of authority and responsibility principle. Of the two types of power, positional and personal, the empirical evidence suggests that the project manager's authority is actually based on power which stems more from his/her personal abilities and less from his/her position. This personal power (the basis for personal authority) is derived from:

- Technical and organizational knowledge
- Management experience
- Maintenance of rapport
- Negotiation with peers and associates
- Building and maintaining alliances
- Being right

The implication is that successful project managers need to develop interpersonal and political skills. This is crucial since their authority is not commensurate with their responsibility. Forging links with others, persuading, manipulating, and forming solid friendships and alliances are some of the requisite skills for effective project management.

Functional managers in matrixed SPOs are managers in the traditional sense. They are responsible for staffing and organizing a group which will have the technical competence to handle any project within its province. Much has been written concerning the responsibilities and roles of traditional managers, and it will not be repeated here. However, the empirical results from this study suggest a word of warning. Recent research suggesting that all managers should use the "better" relationship oriented sources of power (i.e., referent and expert) in motivating employees may not be applicable for functional managers in matrixed SPOs. The data in this study show that strong organizational norms and role expectations have been established in matrixed SPOs. Employees' role expectations are based on behaviors

expected of a manager in a particular position as well as on characteristics unique to that person. The role expectations created by a manager's position are based on job content, the behavior of previous job incumbents, and organizational goals. The role expectations created by the manager are based on what is known about that particular person. These data suggest that functional managers who use expert and referent powers are perceived by their project subordinates as less effective. Similarly, project managers who use their position power are also rated as being ineffective. While determining causality is tenuous in a cross-sectional study, the implication is that violation of perceived role expectations for matrixed managers may have negative effects.

Methodological Implications and Limitations

From a methodological viewpoint, this research contributes to constructing, validating, and testing measurement scales for a number of important managerial behavior constructs, with the clear emphasis on the bases of power of the project and functional managers in matrixed SPOs. These scales should prove quite useful in future studies of social power.

The present study employed several multi-item measurement scales, all of which exhibited highly satisfactory measurement qualities in terms of reliability and validity. The measurement scales employed did not seem to present any serious problems for the respondents; none of the main data collection instruments returned by the respondents had to

be discarded due to anomaly or incompleteness. However, the similarity of items, together with the simple paper-and-pencil format applied to one single instrument, might have produced common method variance, thereby biasing correlations between variables upward (Campbell and Fiske, 1959).

Correlational tools were primarily used to analyze the data. Hence, all the measurements were assumed to be interval scales (Mason and Swanson, 1981; Nunnally, 1978), thus justifying the use of statistical techniques of high metric requirements. In a strict sense, the research data are ordinal level data which should limit data analysis to non-parametric statistics. However, consistent with most research employing multi-point measurement scales, interval level data were assumed.

Furthermore, in conjunction with parametric tests and correlational analysis, the assumptions on which these techniques are based, should be carefully examined. For example, regression analysis is based on assumptions of independence, linearity, normality of the error terms, multicollinearity, and homoskedasticity, i.e., whether the variance of the error terms is constant for all values of the independent variables (Draper and Smith, 1981; Montgomery and Peck, 1982; Neter et al., 1985). In the present study, these regression assumptions were tested for violations and the results supported the assumptions.

Response bias due to measurement artifacts was considered. One way to deal with the problem would be to standardize each subject's scores. However, as Osgood and Tannenbaum (1957) have pointed out,

standardization is believed to involve loss of valuable information, and is therefore not justified unless specific evidence of response bias exists. An explicit examination of the present research data did not uncover any evidence of obvious response bias, indicating that standardization should not be performed.

The highly satisfactory reliability coefficients and some of the highly significant intercorrelations between scales may be spurious due to halo effects¹. Possible causes for the halo effect include fatigue on part of the respondents, subjects having one general, holistic impression, and simple guessing because items elicited are not the salient ones for which subjects have a specific belief (Mason and Swanson, 1981; Nunnally, 1978). The halo effect can not be dealt with easily. After all, the main criterion on which the multi-item scales are evaluated is a satisfactory coefficient alpha representing a high item-to-total correlation. To some extent, the problem might be controlled by retaining only the most discriminatory (or rather the most salient, if they could be identified) items, thus reducing the chances of subject fatigue or guessing and, at the same time, making the data collection instrument more economical and convenient. However, the fewer items that are included, the more each scale will be less specific or relevant in different settings. Moreover, each scale

¹ The halo effect is a tendency to rate an object the same way on all attributes.

will conform less to a domain-sampling model which assumes that each particular measure is being composed of a random sample of items from a hypothetical domain of items (Nunnally, 1978).

As pointed out in Chapter III, a large sample size is a necessary condition for achieving satisfactory statistical power. Low statistical power may in turn be a serious threat to the statistical conclusion validity of the study (Cook and Campbell, 1979). From a test of significance viewpoint, the number of responses per parameter to be estimated in any single analysis of the data should be at least ten (Kerlinger, 1983; Nunnally, 1978). The present sample size ($n = 136$), thus, represents a methodological limitation with respect to parts of the correlational analysis, particularly those parts involving multivariate statistical analyses.

Methodological limitations also arise from the convenience sampling procedure that was employed (cf., pages 77-80). Convenience and sample homogeneity, however, were thought to enhance the theory application generalizability of the study. As long as this is kept in mind, the choice of empirical setting and sampling procedure seems justified.

In sum, it is believed that the methodological contributions of this research outnumber the methodological limitations. However, any methodological shortcoming might create opportunities for future research efforts.

Suggestions for Future Research

Many researchers have noted the lack of a coherent theoretical framework within which the results of different research efforts could be integrated. Lack of such a framework implies a lack of cumulative tradition on which future research efforts could be designed and organized (Kerlinger, 1986; Yukl, 1989a). As already pointed out, it is hoped that the present study would encourage future research efforts using French and Raven's (1959) bases of power as a framework for social power. Some methodological suggestions for future studies include the use of larger and geographically separated samples (i.e., other SPOs within the Aeronautical Systems Division and in other product divisions) to enhance the generalizability of the power scales. In addition, a more rigorous test of the convergent and discriminant validity of the power scales could be done by developing maximally different measurement scales (Campbell and Fiske, 1959).

Further work in establishing criterion-related validity research is also needed. Satisfaction has been a traditional dependent variable in power research (cf. Bass, 1981; Yukl, 1981), and because satisfaction has been shown to be related to other important variables (cf. Locke, 1976), it seems like a fruitful area for analysis and testing. Other criterion-related variables that bear examination include subordinant dependence, conflict, and performance (see Figure 1, page 54). In addition, subordinate commitment to a manager's influence attempt is an area where little knowledge exists. Although

empirical researchers of power do not often study commitment, it has been a central concern of theory in the domain (cf., Pfeffer, 1981), and scholars such as Yukl (1989a) have specifically called for future research on power to routinely include commitment as a dependent variable.

Katz and Kahn's (1966) notion that the essence of organizational leadership is an "influential increment over and above the mechanical compliance with routing directives of the organization" (Katz and Kahn, 1966:301) bears analysis. They assert that incremental influence composed of expert and referent powers, are directly under the control of the individual leader. Legitimate, reward, and coercive powers, on the other hand, are controlled more by the organization than the individual leader and in many organizations, the extent to which leaders can use these power bases is highly constrained, particularly at lower hierarchical levels. Thus, there is a need to examine whether power usage can be distinguished among different level leaders within the same organization.

The issue of group size also needs to be addressed. Quite surprisingly, the size of the subordinate group was not observed or analyzed in any of the power base studies conducted thus far. In research using a different power typology, Knippsis *et al.* (1980) found that in large work units, leaders reported using assertiveness, sanctions, and upward appeals tactics more frequently. The influence tactics are most similar to the coercive and legitimate bases of power studied here. Other studies also provide evidence for group size

effects. For example, in both the bystander intervention (Latane' et al., 1981) and cooperation/competition (Fox and Guyer, 1978; Komorita and Lapworth, 1982; McCallum et al., 1985) literature, it has been well established that prosocial behavior declines as group size increases. Moreover, evidence suggests that work performance is also directly affected. Social loafing often occurs when individual contributions to a group's productivity cannot be assessed (Latane' et al., 1979). Research examining the effects of increasing the number of subordinates with each leader's workgroup needs to be tested.

This study examined only the downward influence behaviors which the project and functional managers used with socially dependent group members. Upward influence of project personnel, lateral influence of other managers, and interorganizational influences are related topics that need exploration (see Allen and Porter, 1983; Kipnis, 1976). In addition, many researchers have criticized the literature on the bases of social power for not attempting to link the study of managerial power to the literature on influence tactics (Kipnis et al., 1980; Salancik and Pfeffer, 1974; Salancik and Pfeffer, 1977; Zanzi, 1989). On the other hand, researchers who have investigated the influence tactics used by managers in various situations have given little attention to the antecedents or consequences of those tactics. Thus, further investigation of the relationships between the various bases of power, influence tactics, and important organizational consequences is needed.

Finally, as noted in Chapter II (see page 56), causal relationships among the power sources have not been considered. Longitudinal studies examining a manager's application of reward and punishment as it affects the strength of the other three power sources need to be conducted. How these relationships exert influence on the impacts of reward and coercion with other criterion-related variables, such as satisfaction and conflict, also needs to be investigated.

Conclusion of the Study

This research makes several valuable contributions to the study of power in organizations. The primary objective of this study was to develop measures for the French and Raven (1959) power bases that demonstrate adequate psychometric properties. As noted in Chapter II, previous field studies employing the French and Raven power taxonomy suffer from several methodological limitations. Great care was taken to design a reliable and valid measuring instrument that addresses these methodological concerns. In order to meet these goals, several innovations over previous studies were employed:

(i) First, scales for each base of power were developed that reflected the full operational definitions for each source of power as originally proposed by French and Raven. Past measuring instruments used very narrow operationalizations of the French and Raven power bases. A comparison with French and Raven's original definitions shows that the power bases are actually theoretically broad concepts. Thus,

potential scale items were developed that attempted to tap the full range and valence of each power base.

(ii) Second, multi-item Likert scales were developed for each power base; another innovation over previous research. Prior measuring instrument relied on single-item, rank-ordered power scales that have highly questionable validity.

(iii) Third, the past scales commonly used attributional rather than behavioral referents which may cause confounding by social desirability and attributional biases. To overcome this problem, only behaviorally anchored questions were used.

In order to insure that the new power base instrument had adequate face and content validity, repeated content analyses of different sets of items and discussion with project personnel, graduate students and faculty were employed in a three-phase pilot study. About 200 different items were considered for the survey instrument, before a final set of 31 items were selected to measure the five bases of power.

Data collected from the final survey instrument were then subjected to considerable psychometric examination (see Chapter IV). Factor analysis provided substantial evidence of construct validity of the new instrument. The majority of the coefficient alpha scale reliabilities exceeded .90, with the lowest scale having a highly reliable .78 coefficient alpha. Factor analyses also provided considerable evidence for both convergent and discriminant validity of the revised power scales. Correlational analyses were then reported containing strong evidence of nomological validity of the final scales.

In addition, as part of the empirical testing of the hypotheses, simple and partial correlation, and simple linear and multiple regression analyses were performed that provided substantial evidence of criterion-related validity of the power base scales.

The empirical testing results presented in Chapter V provide another contribution this research has made to the study of organization power. These results verify the usefulness of the French and Raven power base constructs as operationally defined by the scales developed in this study. Previous studies have demonstrated theoretically inconsistent criterion-related results with the power bases. However, the results obtained here provide strong evidence in validating the theory of power for matrix organizations. In general, the empirical results obtained were correctly predicted by theory. Taken together, the field data lends considerable weight to the argument that the problems of the previous French and Raven power-based studies are of a methodological nature, and not of a theoretical nature.

What has this research added to the understanding of social influence in organizations? The theoretical constructs of French and Raven's social power theory, operationally defined with a reliable and valid measuring instrument, can now be reliably used to systematically explore differential power use both within an organization and across organizations. We now have a conceptual framework on which results of different research efforts can now be integrated. Future investigators

are advised to use the new scales in preference to previous instruments and ad hoc measures. By doing so, the next few years of research should prove more fruitful than the past thirty years since French and Raven developed their power taxonomy.

Appendix A: Survey Instrument



DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

REPLY TO LSR (Capt Wojick, AUTOVON 785-5435)
ATTN OF

15 June 1989

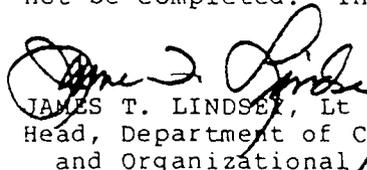
SUBJECT System Program Office (SPO) Matrix Survey

to Survey Participant

1. How do you feel about working in a matrix organization? Here is your chance to express your opinion. We are conducting a survey to learn more about the day-to-day activities of a matrixed SPO and the people who are in it. You can help us in our quest. The attached survey (USAF SCN 89-56) will measure your perceptions and attitudes toward your functional manager and project manager. The survey was prepared by the Air Force Institute of Technology (AFIT), Wright-Patterson AFB OH.

2. Please take a few minutes to complete the survey. Do not place your name or other identification on the computer answer sheets or the survey booklet. All answers are totally anonymous. Upon completion, seal both the survey booklet and the two completed computer score sheets in the attached envelope and return it to the researcher within seven days after receipt.

3. Although your participation in this survey is voluntary, your valued input will be extremely important in the overall evaluation of working relations with project and functional managers. Your time, effort, and cooperation are greatly appreciated, and without your input, this research effort could not be completed. Thank you for your cooperation.


JAMES T. LINDSEY, Lt Colonel, USAF
Head, Department of Communication
and Organizational Sciences
School of Systems and Logistics

3 Atch
1. Survey
2. Two Computer
Answer Sheets
3. Return Envelope

STRENGTH THROUGH KNOWLEDGE

This survey is in three parts. Part one is a short series of demographic job environment questions. Parts two and three contain opinion/attitude questions about your project and functional managers. Mark your answer to each question on both this questionnaire and the optical scan sheet. Darken the spaces on the enclosed optical scan sheet using a number 2 pencil. After completing the survey and the scan sheet, please mail both items back in the enclosed preaddressed envelope.

PART I -- BACKGROUND INFORMATION

This section of the survey concerns your background. The information requested is to insure that all employee groups are represented and not to identify you as an individual.

1. Your age is:

- [1] Less than 20
- [2] 20 to 25
- [3] 26 to 30
- [4] 31 to 40
- [5] 41 to 50
- [6] 51 to 60
- [7] More than 60

2. Your highest educational level obtained is:

- [1] Non high school graduate
- [2] High school graduate or GED
- [3] Some college work
- [4] Associate degree
- [5] Bachelors degree
- [6] Some graduate work
- [7] Master's degree
- [8] Master's degree plus additional graduate studies
- [9] Ph. D. or equivalent

3. Your sex is:

- [1] Male
- [2] Female

4. Total years in the Air Force:
- [1] Less than 1 year
 - [2] 1 year, but less than 2 years
 - [3] 2 years, but less than 3 years
 - [4] 3 years, but less than 4 years
 - [5] 4 years, but less than 8 years
 - [6] 8 years or more
5. Which one of the following System Program Offices (SPOs) do you work for?
- [1] Advanced Cruise Missile SPO
 - [2] Advanced Tactical Fighter SPO
 - [3] B-1 SPO
 - [4] B-2 SPO
 - [5] C-17A SPO
 - [6] F-16 SPO
 - [7] Joint Tactical Autonomous Weapons SPO
 - [8] Lantirn SPO
 - [9] SRAM II SPO
 - [10] Other (fill in) _____
6. How long have you worked in this SPO?
- [1] Less than 1 month
 - [2] 1 month, but less than 6 months
 - [3] 6 months, but less than 12 months
 - [4] 12 months, but less than 18 months
 - [5] 18 months, but less than 24 months
 - [6] 24 months, but less than 36 months
 - [7] 36 months or more
7. Which one of the following most closely represents your work specialty in your current SPO?
- [1] Engineering
 - [2] Test and Evaluation
 - [3] Program Control
 - [4] Configuration Management
 - [5] Contracting (Procurement)
 - [6] Logistics
 - [7] Manufacturing/Quality Assurance
 - [8] Administration
 - [9] Project Management
 - [10] Other (fill in) _____

8. Total months in present job is:

- [1] Less than 1 month
- [2] 1 month, but less than 6 months
- [3] 6 months, but less than 12 months
- [4] 12 months, but less than 18 months
- [5] 18 months, but less than 24 months
- [6] 24 months, but less than 36 months
- [7] 36 months or more

9. How many people do you directly supervise (i.e., those for whom you write performance reports)?

- [1] None
- [2] 1
- [3] 2
- [4] 3
- [5] 4 to 5
- [6] 6 to 8
- [7] 9 or more

10. You are a (an):

- [1] Officer
- [2] Airman/Enlisted
- [3] Civilian (Skip to question 12)



11. Your current rank is:

- [1] E-1 to E-3
- [2] E-4 to E-5
- [3] E-6 to E-7
- [4] E-8 to E-9
- [5] Second lieutenant
- [6] First lieutenant
- [7] Captain
- [8] Major
- [9] Lieutenant Colonel
- [10] Colonel

GO TO NEXT PAGE

12. Your grade level is:

- [1] 1 to 2
- [2] 3 to 4
- [3] 5 to 6
- [4] 7 to 8
- [5] 9 to 10
- [6] 11 to 12
- [7] 13 to 14
- [8] Senior Executive Service

GO TO NEXT PAGE

13. Think of the project manager (not the SPO Director) with whom you work most closely. How long have you been working with him/her?

- [1] Less than 1 month
- [2] 1 month, but less than 6 months
- [3] 6 months, but less than 12 months
- [4] 12 months, but less than 18 months
- [5] 18 months, but less than 24 months
- [6] 24 months, but less than 36 months
- [7] 36 months or more

14. How long have you been working for your functional manager (your reporting official in the chain of command)?

- [1] Less than 1 month
- [2] 1 month, but less than 6 months
- [3] 6 months, but less than 12 months
- [4] 12 months, but less than 18 months
- [5] 18 months, but less than 24 months
- [6] 24 months, but less than 36 months
- [7] 36 months or more

Using the scale below, please indicate the degree to which your project manager and functional manager influenced the following areas of your job:

- [1] MY PROJECT MANAGER DOMINATES
- [2] MOSTLY MY PROJECT MANAGER
- [3] MY PROJECT MANAGER SOMEWHAT MORE THAN MY FUNCTIONAL MANAGER
- [4] ABOUT THE SAME FOR BOTH MY FUNCTIONAL AND PROJECT MANAGERS
- [5] MY FUNCTIONAL MANAGER SOMEWHAT MORE THAN MY PROJECT MANAGER
- [6] MOSTLY MY FUNCTIONAL MANAGER
- [7] MY FUNCTIONAL MANAGER DOMINATES

15. Overall, who has the most influence over the technical details of your project work?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

16. Who has the most influence over your future work assignments?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

17. Who has the most influence over your appraisal rating?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

18. Who has the most influence over the technical quality of your project work?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

19. Who has the most influence over your salary and/or promotion recommendation?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

20. Who has the most influence over your work hours?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

21. Who has the most influence over setting deadlines for your project work tasks?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

PART II -- YOUR PROJECT MANAGER

This section of the survey concerns your attitudes/opinions about the project manager (not the SPO Director) with whom you work most closely. Please indicate how often your project manager performed the following behaviors presented in each item by using the following scale:

	ALMOST				MOST OF	
NEVER	NEVER	SELDOM	SOMETIMES	USUALLY	THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

Remember to mark your answer on both this survey and on the optical scan sheet.

22. My Project Manager exercises a lot of authority over how I perform my job.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

23. My Project Manager provides me with sound, job-related advice.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

24. My Project Manager relies on our good relations with one another to get the job done.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

25. My Project Manager recommended me for a promotion each time I was qualified.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

26. My Project Manager takes disciplinary action or reprimands me when/if my work is below standard.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

27. My Project Manager makes me feel like he approves of me as a person.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

	ALMOST				MOST OF	
NEVER	NEVER	SELDOM	SOMETIMES	USUALLY	THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

28. My Project Manager expects me to follow his or her requests since we are both on the same team and thus working toward the same goal.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

29. My Project Manager expects his or her recommendations will be carried out since (s)he is the senior manager on my team.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

30. My Project Manager sets the example and relies upon me to follow his or her example.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

31. My Project Manager gets me to accomplish the work by demonstrating that (s)he knows how to perform the task.

[1]--- ---[2]-----[3]-----[4]-----[5]-----[6]-----[7]

32. My Project Manager personally pays me a compliment when/if I do outstanding work.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

33. My Project Manager makes me feel valued.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

34. My Project Manager relies on me to get the job done because I don't want to let him or her down.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

	ALMOST					MOST OF	
NEVER	NEVER	SELDOM	SOMETIMES	USUALLY	THE TIME	ALWAYS	
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]	

35. My Project Manager gives me undesirable job assignments when/if I don't cooperate with him or her.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

36. My Project Manager lets me know (s)he has the right to expect my cooperation because (s)he outranks me.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

37. My Project Manager rewards me with desirable job assignments.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

38. When/if I do outstanding work, my Project Manager rewards me with high performance ratings or tells the person who writes my performance evaluation.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

39. My Project Manager is critical of my work even when I perform well.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

40. My Project Manager relies on our friendship in getting me to do the job.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

41. My Project Manager recommends me for awards or commendations when my work is consistently above average.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

	ALMOST				MOST OF	
NEVER	NEVER	SELDOM	SOMETIMES	USUALLY	THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

- 42. My Project Manager makes on the spot corrections.
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 43. My Project Manager tells me what to do because (s)he has the authority to do so.
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 44. My Project Manager impresses me with his or her overall competence and ability.
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 45. My Project Manager expects me to follow his or her orders because (s)he has information that I don't have and thus a good reason for issuing any order.
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 46. My Project Manager shares his or her experience and/or training with me.
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 47. My Project Manager makes me work overtime when I don't meet established task deadlines.
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 48. My Project Manager gives me extra work as punishment when/if I don't comply with his or her orders.
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

	ALMOST				MOST OF	
NEVER	NEVER	SELDOM	SOMETIMES	USUALLY	THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

49. My Project Manager makes sure I get rewarded with time off when my work performance is especially good.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

50. My Project Manager gives me low performance ratings when/if I work below acceptable standards or tells the person who writes my performance evaluation.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

51. My Project Manager does not know what (s)he is doing.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

52. My Project Manager chews me out when I perform badly.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

Please indicate the extent to which you agree or disagree with the following statement or concept presented in each item by using the following scale:

STRONGLY DISAGREE DISAGREE SLIGHTLY DISAGREE SLIGHTLY AGREE AGREE STRONGLY AGREE

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

Remember, answer these questions regarding the project manager (not the SPO Director) for whom you work most closely.

53. My Project Manager is an effective manager.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

54. My Project Manager displays effective managerial behaviors.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

55. My Project Manager displays strong managerial abilities.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

56. My Project Manager is one of the best managers I have ever had.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

57. My Project Manager is one of the best managers in my SPO.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

Please indicate the extent to which your project manager (not the SPO Director) influences the areas of your job by using the following scale:

NOT AT ALL	TO A MODERATE EXTENT	TO A VERY GREAT EXTENT				
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

- 58. Overall, how much does your Project Manager influence the technical details of your project work?
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 59. How much does your Project Manager influence your future work assignments?
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 60. How much does your Project Manager influence your appraisal rating?
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 61. How much does your Project Manager influence the technical quality of your project work?
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 62. How much does your Project Manager influence your salary and/or promotion recommendations?
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 63. How much does your Project Manager influence your work hours?
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

- 64. How much does your Project Manager influence the setting of deadlines for your project work?
[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

PART III -- YOUR FUNCTIONAL MANAGER

This section of the survey concerns your attitudes/opinions about the functional manager in your chain of command. Please indicate the extent to which your functional manager influences the following areas of your job by using the following scale:

NOT AT							TO A
ALL			TO A MODERATE				VERY GREAT
			EXTENT				EXTENT
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]	

65. Overall, how much does your Functional Manager influence the technical details of your project work?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

66. How much does your Functional Manager influence your future work assignments?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

67. How much does your Functional Manager influence your appraisal rating?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

68. How much does your Functional Manager influence the technical quality of your project work?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

69. How much does your Functional Manager influence your salary and/or promotion recommendations?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

70. How much does your Functional Manager influence your work hours?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

71. How much does your Functional Manager influence the setting of deadlines for your project work?

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

Please indicate the extent to which you agree or disagree with the following statement or concept presented in each item by using the following scale:

STRONGLY DISAGREE DISAGREE SLIGHTLY DISAGREE SLIGHTLY AGREE AGREE STRONGLY AGREE

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

Remember, answer these questions regarding the functional manager for which you work most closely.

72. My Functional Manager is an effective manager.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

73. My Functional Manager displays effective managerial behaviors.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

74. My Functional Manager displays strong managerial abilities.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

75. My Functional Manager is one of the best managers I have ever had.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

76. My Functional Manager is one of the best managers in my SPO.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]

Please indicate how often your functional manager performed the following behaviors presented in each item by using the following scale:

NEVER	ALMOST NEVER	SELDOM	SOMETIMES	USUALLY	MOST OF THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

Remember to mark your answer on both this survey and on the optical scan sheet.

77. My Functional Manager exercises a lot of authority over how I perform my job.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

78. My Functional Manager provides me with sound, job-related advice.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

79. My Functional Manager relies on our good relations with one another to get the job done.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

80. My Functional Manager recommended me for a promotion each time I was qualified.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

Please take your responses from the booklet and fill in the first answer sheet now. Your first answer sheet should be completely filled. Please go back and check the sequencing of your answers to make sure you haven't skipped any items. Use the second answer sheet to respond to the remaining items in the questionnaire.

Please indicate how often your functional manager performed the following behaviors presented in each item by using the following scale:

NEVER	ALMOST NEVER	SELDOM	SOMETIMES	USUALLY	MOST OF THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

Remember to mark your answer on both this survey and on the optical scan sheet.

1. My Functional Manager takes disciplinary action or reprimands when/if my work is below standard.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

2. My Functional Manager makes me feel like he approves of me as a person.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

3. My Functional Manager expects me to follow his or her requests since we are both on the same team and thus working toward the same goal.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

4. My Functional Manager expects his or her recommendations will be carried out since (s)he is the boss.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

5. My Functional Manager sets the example and relies upon me to follow his or her example.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

6. My Functional Manager gets me to accomplish the work by demonstrating that (s)he knows how to perform the task.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

	ALMOST				MOST OF	
NEVER	NEVER	SELDOM	SOMETIMES	USUALLY	THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

7. My Functional Manager personally pays me a compliment when/if I do outstanding work.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

8. My Functional Manager makes me feel valued.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

9. My Functional Manager relies on me to get the job done because I don't want to let him or her down.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

10. My Functional Manager gives me undesirable job assignments when/if I don't cooperate with him or her.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

11. My Functional Manager lets me know (s)he has the right to expect my cooperation because (s)he outranks me.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

12. My Functional Manager rewards me with desirable job assignments.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

13. When/if I do outstanding work, my Functional Manager rewards me with high performance ratings or tells the person who writes my performance evaluation.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

14. My Functional Manager is critical of my work even when I perform well.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

NEVER	ALMOST NEVER	SELDOM	SOMETIMES	USUALLY	MOST OF THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

15. My Functional Manager relies on our friendship in getting me to do the job.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

16. My Functional Manager recommends me for awards or commendations when my work is consistently above average.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

17. My Functional Manager makes on the spot corrections.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

18. My Functional Manager tells me what to do because (s)he has the authority to do so.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

19. My Functional Manager impresses me with his or her overall competence and ability.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

20. My Functional Manager expects me to follow his or her orders because (s)he has information that I don't have and thus a good reason for issuing any order.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

21. My Functional Manager shares his or her experience and/or training with me.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

	ALMOST				MOST OF	
NEVER	NEVER	SELDOM	SOMETIMES	USUALLY	THE TIME	ALWAYS
[1]-----	[2]-----	[3]-----	[4]-----	[5]-----	[6]-----	[7]

22. My Functional Manager makes me work overtime when I don't meet established task deadlines.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

23. My Functional Manager gives me extra work as punishment when/if I don't comply with his or her orders.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

24. My Functional Manager makes sure I get rewarded with time off when my work performance is especially good.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

25. My Functional Manager gives me low performance ratings when/if I work below acceptable standards.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

26. My Functional Manager does not know what (s)he is doing.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

27. My Functional Manager chews me out when I perform badly.

[1]-----[2]-----[3]-----[4]-----[5]-----[6]-----[7]

 Please take your responses from the booklet and fill in the second answer sheet now.

Now place the two answer sheets and the survey booklet in the pre-addressed envelope. Please mail your responses as soon as possible. Thank you for your participation and cooperation.

Appendix B: Internal Consistency Reliability
Analysis of Original Scales

SCALE	SCALE ITEM	ITEM MEAN	ITEM STD. DEV.	ITEM-TO-TOTAL CORRELATION
Project Manager's Reward Power	REPM1	2.21	0.98	0.77
	REPM2	2.23	1.06	0.62
	REPM3	2.29	1.08	0.81
	REPM4	2.38	1.16	0.69
	REPM5	2.22	1.08	0.77
	REPM6	2.26	1.01	0.79
Project Manager's Coercive Power	COPM1	1.72	1.06	0.61
	COPM2	1.56	0.99	0.78
	COPM3	1.85	1.34	0.02
	COPM4	1.52	0.95	0.77
	COPM5	1.42	0.95	0.85
	COPM6	1.54	0.93	0.78
	COPM7	1.52	1.00	0.70
Project Manager's Legitimate Power	LEPM1	3.01	0.68	0.60
	LEPM2	2.97	0.72	0.46
	LEPM3	3.00	0.67	0.55
	LEPM4	2.82	0.88	0.55
	LEPM5	2.88	1.05	0.52
	LEPM6	2.94	1.05	0.48
Project Manager's Expert Power	EXPM1	5.11	0.71	0.48
	EXPM2	5.06	0.71	0.61
	EXPM3	4.88	1.12	0.57
	EXPM4	4.96	1.09	0.66
	EXPM5	4.87	1.13	0.71
	EXPM6	3.39	1.41	0.05
Project Manager's Referent Power	RFPM1	6.68	0.75	0.76
	RFPM2	6.58	0.81	0.59
	RFPM3	6.65	0.83	0.65
	RFPM4	6.69	0.74	0.74
	RFPM5	6.71	0.72	0.77
	RFPM6	6.46	1.15	0.48

SCALE	SCALE ITEM	ITEM MEAN	ITEM STD. DEV.	ITEM-TO-TOTAL CORRELATION
Functional Manager's Reward Power	REFM1	5.74	1.77	0.50
	REFM2	6.01	1.46	0.77
	REFM3	5.55	1.87	0.77
	REFM4	5.91	1.49	0.75
	REFM5	5.85	1.70	0.77
	REFM6	5.46	2.03	0.81
Functional Manager's Coercive Power	COFM1	4.39	1.58	0.81
	COFM2	4.41	1.46	0.91
	COFM3	1.96	1.31	-0.09
	COFM4	4.59	1.48	0.77
	COFM5	4.43	1.56	0.92
	COFM6	4.43	1.53	0.81
	COFM7	4.30	1.71	0.79
Functional Manager's Legitimate Power	LEFM1	5.80	1.63	0.68
	LEFM2	6.01	1.39	0.86
	LEFM3	6.05	1.31	0.89
	LEFM4	6.04	1.43	0.88
	LEFM5	6.03	1.36	0.88
	LEFM6	5.77	1.51	0.79
Functional Manager's Expert Power	EXFM1	3.38	1.31	0.70
	EXFM2	3.29	1.19	0.80
	EXFM3	3.27	1.26	0.66
	EXFM4	3.35	1.21	0.82
	EXFM5	3.43	1.31	0.82
	EXFM6	4.87	1.23	0.17
Functional Manager's Referent Power	RFFM1	2.35	1.63	0.67
	RFFM2	2.49	1.74	0.90
	RFFM3	2.31	1.49	0.87
	RFFM4	2.38	1.70	0.93
	RFFM5	2.52	1.81	0.85
	RFFM6	2.16	1.33	0.74

SCALE	SCALE ITEM	ITEM MEAN	ITEM STD. DEV.	ITEM-TO-TOTAL CORRELATION
Project Manager's Effectiveness	PMEFF1	4.51	1.23	0.67
	PMEFF2	4.59	1.06	0.86
	PMEFF3	4.55	1.00	0.85
	PMEFF4	4.11	1.27	0.83
	PMEFF5	4.39	1.21	0.86
Functional Manager's Effectiveness	FMEFF1	4.16	1.18	0.91
	FMEFF2	4.12	1.15	0.90
	FMEFF3	3.97	1.25	0.91
	FMEFF4	3.61	1.37	0.88
	FMEFF5	3.77	1.36	0.83
Project Manager's Overall Influence	PMINFLU1	3.48	1.36	0.51
	PMINFLU2	3.16	1.40	0.53
	PMINFLU3	2.27	1.76	0.71
	PMINFLU4	2.35	1.63	0.67
	PMINFLU5	1.98	1.70	0.69
	PMINFLU6	2.97	1.32	0.15
	PMINFLU7	3.72	1.51	0.57
Functional Manager's Overall Influence	FMINFLU1	4.70	1.32	0.73
	FMINFLU2	5.30	1.31	0.54
	FMINFLU3	6.35	1.28	0.68
	FMINFLU4	5.70	1.83	0.69
	FMINFLU5	6.14	1.51	0.64
	FMINFLU6	4.64	1.63	0.80
	FMINFLU7	4.67	1.49	0.67

Appendix C: Convergent and Discriminant Validity
of Revised Scale Items

	FMCOERCE FACTOR 1	FMLEGIT FACTOR 2	FMREFER FACTOR 3	FMEFFECT FACTOR 4	PMCOERCE FACTOR 5	PMEFFECT FACTOR 6	COMMU- NALITY
REPM1	.232	-.046	-.004	-.050	-.119	.106	.762
REPM2	-.182	.045	-.045	.113	-.089	-.052	.665
REPM3	-.016	-.113	-.025	-.006	-.060	.084	.785
REPM4	-.100	-.150	.084	-.076	-.072	.218	.746
REPM5	.075	-.078	.034	-.048	.017	.194	.795
REPM6	.053	-.061	.005	.017	-.112	-.036	.767
COPM1	-.013	.026	-.232	-.083	<u>.731</u>	-.027	.651
COPM2	.040	-.145	.012	-.147	<u>.838</u>	-.008	.789
COPM4	.004	-.053	.079	-.001	<u>.872</u>	-.026	.804
COPM5	.089	-.059	.013	-.049	<u>.922</u>	-.029	.874
COPM6	.057	.047	-.027	-.110	<u>.859</u>	-.027	.780
COPM7	-.087	-.090	.058	.028	<u>.821</u>	-.064	.737
LEPM1	-.179	-.026	-.207	.016	.056	.035	.660
LEPM2	-.076	.127	-.153	.109	.006	.029	.541
LEPM3	.030	.085	.090	.038	.085	.015	.560
LEPM4	.053	-.013	-.136	.109	-.019	.001	.625
LEPM5	.185	-.061	.085	-.069	.062	-.074	.587
LEPM6	.115	-.178	.033	-.116	-.081	.168	.573
EXPM1	-.050	-.055	.105	-.058	.100	-.092	.796
EXPM2	.024	.055	-.061	-.106	-.004	-.182	.629
EXPM3	.147	.057	-.246	-.062	-.121	.037	.709
EXPM4	.148	.151	-.164	.055	-.029	.233	.765
EXPM5	.228	.005	-.233	-.096	-.074	.229	.801
RFPM1	.066	.085	.069	.073	.022	-.043	.755
RFPM2	-.056	-.107	-.048	.175	-.008	-.021	.618
RFPM3	.040	.054	-.023	-.004	.008	-.119	.599
RFPM4	.081	.023	.012	.005	.095	-.051	.728
RFPM5	-.065	.020	-.001	.088	-.020	-.045	.775
RFPM6	.236	.068	-.155	-.065	-.043	.215	.536
Eigen- value	14.073	8.748	5.856	5.067	4.342	3.897	
Pct of Var	17.2	10.7	7.1	6.2	5.3	4.8	74.4

¹ Items greater than 0.500 are underscored for emphasis

	PMREWARD FACTOR 7	FMINFLUE FACTOR 8	PMREFER FACTOR 9	PMINFLUE FACTOR 10	FMEXPERT FACTOR 11	FMREWARD FACTOR 12	PMEXPERT FACTOR 13	PMLEGIT FACTOR 14
REPM1	<u>.800</u>	.030	-.142	-.070	.030	.066	-.075	.006
REPM2	<u>.756</u>	.119	-.025	.106	-.055	-.047	-.034	-.020
REPM3	<u>.859</u>	-.103	-.064	-.030	-.019	-.056	-.050	.036
REPM4	<u>.703</u>	-.269	-.050	-.068	.021	-.175	-.194	.073
REPM5	<u>.840</u>	.118	-.017	.092	.082	.065	-.045	-.041
REPM6	<u>.847</u>	-.006	-.071	-.082	-.024	.095	-.071	.002
COPM1	-.024	.006	.059	-.076	.080	-.079	-.178	.017
COPM2	-.086	-.113	.022	-.045	-.012	-.065	.049	.113
COPM4	-.090	-.105	.019	.009	-.079	-.077	-.032	.026
COPM5	-.023	-.054	-.025	.051	-.011	-.015	.018	.050
COPM6	-.118	-.000	-.005	-.005	.093	.022	-.023	.013
COPM7	-.055	-.079	-.002	.054	-.023	.133	.032	-.086
LEPM1	.039	.080	-.126	.052	.009	-.072	-.007	<u>.740</u>
LEPM2	-.165	-.138	-.105	-.100	.064	.046	-.059	<u>.637</u>
LEPM3	.017	-.048	-.089	.035	-.006	.019	-.104	<u>.716</u>
LEPM4	.110	.034	.008	-.093	-.066	.324	.047	<u>.677</u>
LEPM5	.000	.115	-.037	.018	-.156	.020	.146	<u>.683</u>
LEPM6	.033	-.086	.055	.136	.029	-.115	-.001	<u>.659</u>
EXPM1	-.232	.025	.068	-.071	-.197	-.318	<u>.742</u>	.051
EXPM2	-.258	.056	.011	.007	.002	-.035	<u>.712</u>	-.013
EXPM3	-.011	.093	-.051	.065	-.170	.157	<u>.731</u>	-.004
EXPM4	-.012	-.046	.021	-.041	-.030	.091	<u>.788</u>	.024
EXPM5	-.002	-.027	-.021	.001	.047	.063	<u>.785</u>	-.069
RFPM1	.029	.013	<u>.832</u>	-.086	-.082	.113	.072	-.075
RFPM2	-.009	.085	<u>.733</u>	-.086	.114	.025	-.034	-.059
RFPM3	-.096	.008	<u>.731</u>	.030	.111	-.076	-.056	-.119
RFPM4	-.167	.013	<u>.819</u>	.044	-.093	.009	-.008	-.013
RFPM5	-.057	-.020	<u>.845</u>	.024	-.095	.142	-.026	-.109
RFPM6	-.170	.141	<u>.590</u>	.090	-.099	-.035	.100	.143
Eigen- value	3.258	2.981	2.708	2.609	2.356	1.820	1.744	1.538
Pct of Var	4.0	3.6	3.3	3.2	2.9	2.2	2.1	1.9

¹ Items greater than 0.500 are underscored for emphasis

	FMCOERCE FACTOR 1	FMLEGIT FACTOR 2	FMREFER FACTOR 3	FMEFFECT FACTOR 4	PMCOERCE FACTOR 5	PMEFFECT FACTOR 6	COMMU- NALITY
REFM1	.276	.289	.135	-.081	-.080	.270	.554
REFM2	.389	.374	-.094	.163	-.091	.197	.767
REFM3	.476	.292	-.134	.129	.000	.173	.770
REFM4	.312	.175	.071	.008	.051	.142	.815
REFM5	.376	.185	-.084	.085	-.037	.214	.757
REFM6	.467	.272	-.307	.093	-.071	.197	.856
COFM1	<u>.778</u>	.193	-.239	.019	-.055	.148	.759
COFM2	<u>.866</u>	.110	-.242	.008	.062	.083	.875
COFM4	<u>.751</u>	.229	-.214	.021	.084	.017	.731
COFM5	<u>.869</u>	.115	-.250	.008	-.008	.117	.898
COFM6	<u>.811</u>	.123	-.198	.020	.034	.118	.807
COFM7	<u>.786</u>	.126	-.236	-.002	.039	.028	.766
LEFM1	.067	<u>.753</u>	-.068	.099	-.096	.048	.654
LEFM2	.146	<u>.843</u>	-.027	.205	-.083	.069	.830
LEFM3	.166	<u>.884</u>	-.039	.130	-.043	.105	.871
LEFM4	.157	<u>.850</u>	.000	.144	-.016	.177	.867
LEFM5	.115	<u>.860</u>	-.018	.117	-.073	.161	.856
LEFM6	.210	<u>.827</u>	-.073	.057	.026	.083	.777
EXFM1	-.183	-.041	.338	.232	-.013	.003	.684
EXFM2	-.052	.118	.235	.140	.062	-.095	.754
EXFM3	-.058	.062	.143	-.011	-.030	-.175	.666
EXFM4	-.132	-.012	.296	.109	-.003	-.019	.814
EXFM5	-.113	.031	.256	.218	.031	-.019	.784
RFFM1	-.235	-.069	<u>.629</u>	.034	-.029	-.148	.572
RFFM2	-.337	-.051	<u>.821</u>	.031	-.002	-.126	.881
RFFM3	-.289	-.010	<u>.778</u>	.146	.011	-.153	.828
RFFM4	-.311	-.032	<u>.839</u>	.121	-.023	-.113	.907
RFFM5	-.293	-.042	<u>.807</u>	.081	-.046	-.085	.844
RFFM6	-.100	-.057	<u>.751</u>	-.064	.006	-.014	.700
Eigen- value	14.073	8.748	5.856	5.067	4.342	3.897	
Pct of Var	17.2	10.7	7.1	6.2	5.3	4.8	74.4

¹Items greater than 0.500 are underscored for emphasis

	PMREWARD FACTOR 7	FMINFLUE FACTOR 8	PMREFER FACTOR 9	PMINFLUE FACTOR 10	FMEPERT FACTOR 11	FMREWARD FACTOR 12	PMEXPERT FACTOR 13	PMLEGIT FACTOR 14
REFM1	-.170	.141	.078	-.033	.021	<u>.630</u>	-.093	.028
REFM2	-.031	.194	.013	-.116	.008	<u>.582</u>	.042	.016
REFM3	.103	-.003	.164	-.057	-.016	<u>.562</u>	.158	.109
REFM4	-.008	.221	.113	-.069	.093	<u>.762</u>	-.053	-.022
REFM5	-.034	.215	.025	-.087	.010	<u>.677</u>	.007	.073
REFM6	.022	.049	.065	-.131	-.110	<u>.602</u>	.038	.130
COFM1	-.071	.080	.032	.062	-.021	.063	.072	.091
COFM2	.009	.094	.026	.018	-.104	.130	.077	-.018
COFM4	-.031	.129	-.009	.012	-.117	.168	.014	-.024
COFM5	.003	.122	.045	.012	-.128	.107	.096	.009
COFM6	.064	.074	.059	.144	-.083	.195	.139	.051
COFM7	.113	.149	.037	-.056	-.066	.124	.095	-.006
LEFM1	-.089	.101	.067	.020	.138	.038	.038	.106
LEFM2	-.018	.147	.014	-.017	-.005	.140	.034	.038
LEFM3	.004	.142	.003	.050	.036	.078	.008	-.031
LEFM4	-.090	.119	.032	-.048	-.067	.177	.068	.031
LEFM5	-.111	.146	.002	.004	.030	.129	.012	-.078
LEFM6	-.083	.041	.011	-.077	.020	.019	.063	-.119
EXFM1	.008	.118	.023	.129	<u>.669</u>	.010	-.027	-.018
EXFM2	.020	.068	-.028	.044	<u>.799</u>	.055	-.005	.002
EXFM3	.000	.228	-.169	.070	<u>.717</u>	-.057	-.055	-.040
EXFM4	-.007	.084	.002	.014	<u>.801</u>	.120	-.184	-.001
EXFM5	-.003	.088	.049	.014	<u>.794</u>	-.091	-.033	-.076
RFFM1	-.021	.121	.021	.122	.200	.118	-.094	-.012
RFFM2	-.013	.070	.026	-.014	.197	-.099	-.112	-.080
RFFM3	.043	.081	.051	-.005	.254	-.073	-.114	-.009
RFFM4	-.046	.073	-.030	-.027	.217	-.069	-.128	-.018
RFFM5	.046	.014	-.078	.103	.178	-.133	-.112	-.089
RFFM6	.008	-.015	-.111	-.166	.258	.005	-.094	-.056
Eigen- value	3.258	2.981	2.708	2.609	2.356	1.820	1.744	1.538
Pct of Var	4.0	3.6	3.3	3.2	2.9	2.2	2.1	1.9

¹ Items greater than 0.500 are underscored for emphasis

	FMCOERCE FACTOR 1	FMLEGIT FACTOR 2	FMREFER FACTOR 3	FMEFFECT FACTOR 4	PMCOERCE FACTOR 5	PMEFFECT FACTOR 6	COMMU- NALITY
PMEFF1	.252	.033	-.103	.130	-.045	<u>.739</u>	.692
PMEFF2	.061	.142	.007	.080	-.027	<u>.886</u>	.845
PMEFF3	.073	.230	-.105	.179	.008	<u>.820</u>	.829
PMEFF4	.049	.127	-.162	.062	-.073	<u>.843</u>	.816
PMEFF5	.112	.108	-.235	.078	-.046	<u>.830</u>	.871
FMEFF1	-.005	.104	.100	<u>.911</u>	-.064	.041	.908
FMEFF2	-.025	.151	.082	<u>.888</u>	-.106	.121	.891
FMEFF3	.005	.145	.064	<u>.905</u>	-.066	.067	.891
FMEFF4	.032	.185	-.021	<u>.885</u>	-.092	.106	.856
FMEFF5	.101	.127	.047	<u>.812</u>	-.045	.132	.763
PMINFLU1	.020	-.096	.106	-.129	.027	-.009	.617
PMINFLU2	.038	.056	-.129	-.099	-.061	.148	.610
PMINFLU3	-.193	-.059	-.126	.213	.017	.017	.756
PMINFLU4	-.076	-.165	.116	.083	.216	.019	.763
PMINFLU5	-.103	.021	-.037	.202	.039	-.022	.711
PMINFLU6	.196	-.035	.019	-.062	-.154	-.039	.639
PMINFLU7	.147	.073	.198	.042	-.026	-.077	.625
FMINFLU1	.132	.178	.025	.063	.027	.051	.727
FMINFLU2	-.079	-.014	.124	.189	.040	-.084	.572
FMINFLU3	.335	.128	.132	.047	-.046	.130	.684
FMINFLU4	.300	.302	-.033	-.019	-.099	.037	.775
FMINFLU5	.279	-.021	.102	.004	-.150	.075	.597
FMINFLU6	.024	.197	-.000	.084	-.114	.022	.787
FMINFLU7	.079	.225	-.018	.160	.010	-.053	.717
Eigen- value	14.073	8.748	5.856	5.067	4.342	3.897	
Pct of Var	17.2	10.7	7.1	6.2	5.3	4.8	74.4

¹Items greater than 0.500 are underscored for emphasis

	PMREWARD FACTOR 7	FMINFLUE FACTOR 8	PMREFER FACTOR 9	PMINFLUE FACTOR 10	FMEXPERT FACTOR 11	FMREWARD FACTOR 12	PMEXPERT FACTOR 13	PMLEGIT FACTOR 14
PMEFF1	.080	-.035	.034	.005	-.067	-.096	-.027	.169
PMEFF2	.130	.036	-.019	.008	-.051	.054	.059	-.043
PMEFF3	.130	.000	-.074	.045	-.017	.102	.134	.041
PMEFF4	-.040	.066	-.021	-.011	-.066	.197	-.009	-.013
PMEFF5	.083	-.002	-.142	.009	-.117	.227	.050	.006
FMEFF1	.019	.104	.110	.017	.143	-.004	-.041	.013
FMEFF2	.047	.050	.101	.049	.164	.025	-.030	-.020
FMEFF3	.010	.077	.063	.031	.153	.001	-.007	.062
FMEFF4	-.040	.066	.025	.032	.044	.078	-.039	-.015
FMEFF5	-.043	.144	.018	.061	.098	.067	-.113	.041
PMINFLU1	-.232	-.088	-.241	<u>.585</u>	-.009	-.285	-.184	-.022
PMINFLU2	-.050	-.031	-.040	<u>.708</u>	.014	.206	-.063	.004
PMINFLU3	-.050	-.311	.002	<u>.737</u>	-.018	-.095	.008	.036
PMINFLU4	-.108	-.211	-.214	<u>.660</u>	.228	-.256	-.062	.063
PMINFLU5	.014	-.236	.104	<u>.765</u>	-.030	-.013	.019	.063
PMINFLU6	.202	-.120	.277	<u>.626</u>	-.005	.135	.164	-.024
PMINFLU7	.105	-.056	-.019	<u>.666</u>	.163	-.248	.048	-.050
FMINFLU1	.063	<u>.791</u>	.077	-.012	.145	.058	.092	.024
FMINFLU2	-.151	<u>.681</u>	-.042	-.066	.089	.019	.040	-.058
FMINFLU3	-.101	<u>.609</u>	-.005	-.343	-.008	.050	-.060	-.111
FMINFLU4	.096	<u>.654</u>	.103	-.169	-.053	.316	.051	-.003
FMINFLU5	-.062	<u>.612</u>	-.062	-.259	-.018	.168	-.016	-.040
FMINFLU6	.049	<u>.804</u>	.076	-.167	.151	.142	-.030	.033
FMINFLU7	.034	<u>.715</u>	-.009	-.202	.257	-.082	-.001	.070
Eigen- value	3.258	2.981	2.708	2.609	2.356	1.820	1.744	1.538
Pct of Var	4.0	3.6	3.3	3.2	2.9	2.2	2.1	1.9

¹Items greater than 0.500 are underscored for emphasis

Appendix D: Descriptive Data Analyses of Survey Respondents

Table 48

Functional Job Title

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Engineering	44	32.3	32.3
2	Test and Evaluation	10	7.4	39.7
3	Program Control	21	15.4	55.1
4	Configuration Management	5	3.7	58.8
5	Contracting	14	10.3	69.1
6	Logistics	25	18.4	87.5
7	Manufacturing/ Quality Assurance	16	11.8	99.3
8	Safety	<u>1</u>	<u>.7</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>3.55</u>	Mode <u>1.00</u>	Median <u>3.00</u>	

Table 49

Number of Personnel Supervised

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	None	119	87.5	87.5
2	1	1	.7	88.2
3	2	3	2.2	90.4
4	3	1	.7	91.2
5	4 to 5	9	6.6	97.8
6	6 to 8	2	1.5	99.3
7	9 or more	<u>1</u>	<u>.7</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>1.46</u>	Mode <u>1.00</u>	Median <u>1.00</u>	

Table 50
Military and Civilian Proportions

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Officer	51	37.8	37.8
2	Airman/Enlisted	2	1.5	39.3
3	Civilian	<u>82</u>	<u>60.7</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>2.23</u>	Mode <u>3.00</u>		Median <u>3.00</u>

Table 51
General Schedule (GS) Grade

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	GS-1/2	0	0.0	0.0
2	GS-3/4	0	0.0	0.0
3	GS-5/6	4	4.9	4.9
4	GS-7/8	4	4.9	9.8
5	GS-9/10	10	12.2	22.0
6	GS-11/12	42	51.2	73.2
7	GS-13/14	<u>22</u>	<u>26.8</u>	100.0
	TOTAL	<u>82</u>	<u>100.0</u>	
	Mean <u>5.96</u>	Mode <u>6.00</u>		Median <u>6.00</u>

Table 52
Military Rank

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	E-1 to E-3	0	0.0	0.0
2	E-4 to E-5	0	0.0	0.0
3	E-6 to E-7	0	0.0	0.0
4	E-8 to E-9	2	3.8	3.8
5	2nd Lieutenant	4	7.5	11.3
6	1st Lieutenant	17	32.1	43.4
7	Captain	23	43.4	86.8
8	Major	5	9.4	96.2
9	Lt Colonel	<u>2</u>	<u>3.8</u>	100.0
	TOTAL	<u>53</u>	<u>100.0</u>	
	Mean <u>5.96</u>	Mode <u>6.00</u>	Median <u>6.00</u>	

Table 53
Tenure with Air Force in Years

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Less than one year	2	1.5	1.5
2	1 to less than 2 years	6	4.4	5.9
3	2 to less than 3 years	16	11.9	17.8
4	3 to less than 4 years	7	5.2	23.0
5	4 to less than 8 years	28	20.7	43.7
6	8 years or more	<u>76</u>	<u>56.3</u>	100.0
	TOTAL	<u>135</u>	<u>100.0</u>	
	Mean <u>5.08</u>	Mode <u>6.00</u>	Median <u>6.00</u>	

Table 54

Tenure in SPO in Months

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Less than 1 month	2	1.5	1.5
2	1 to less than 6 months	4	3.0	4.4
3	6 to less than 12 months	15	11.1	15.6
4	12 to less than 18 months	20	14.8	30.4
5	18 to less than 24 months	31	23.0	53.3
6	24 to less than 36 months	31	23.0	76.3
7	36 months or more	<u>32</u>	<u>23.7</u>	100.0
	TOTAL	<u>135</u>	<u>100.0</u>	
	Mean <u>5.12</u>	Mode <u>7.00</u>	Median <u>5.00</u>	

Table 55

Tenure in Position in Months

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Less than 1 month	2	1.5	1.5
2	1 to less than 6 months	3	2.2	3.7
3	6 to less than 12 months	15	11.0	14.7
4	12 to less than 18 months	19	14.0	28.7
5	18 to less than 24 months	29	21.3	50.0
6	24 to less than 36 months	32	23.5	73.5
7	36 months or more	36	26.5	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>5.28</u>	Mode <u>7.00</u>	Median <u>5.50</u>	

Table 56

Tenure with Project Manager in Months

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Less than 1 month	2	1.5	1.5
2	1 to less than 6 months	5	3.7	5.1
3	6 to less than 12 months	28	20.6	25.7
4	12 to less than 18 months	23	16.9	42.6
5	18 to less than 24 months	29	21.3	64.0
6	24 to less than 36 months	24	17.5	81.6
7	36 months or more	<u>25</u>	<u>18.4</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>4.79</u>	Mode <u>7.00</u>	Median <u>5.00</u>	

Table 57

Tenure with Functional Manager in Months

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Less than 1 month	1	0.7	0.7
2	1 to less than 6 months	7	5.1	5.9
3	6 to less than 12 months	20	14.7	20.6
4	12 to less than 18 months	24	17.6	38.2
5	18 to less than 24 months	31	22.8	61.0
6	24 to less than 36 months	27	19.9	80.9
7	36 months or more	<u>26</u>	<u>19.1</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>4.93</u>	Mode <u>7.00</u>	Median <u>5.00</u>	

Table 58
Age in Years

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	20 to 25	20	14.7	14.7
2	26 to 30	30	22.1	36.8
3	31 to 40	46	33.8	70.6
4	41 to 50	24	17.6	88.2
5	51 to 60	13	9.6	97.8
6	More than 60	3	2.2	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>3.92</u>	Mode <u>4.00</u>	Median <u>4.00</u>	

Table 59
Education Level

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Non high school graduate	0	0.0	0.0
2	High school or GED	4	2.9	2.9
3	Some college	11	8.1	11.0
4	Associate degree	9	6.6	17.6
5	Bachelors degree	35	25.7	43.4
6	Some graduate work	40	29.4	72.8
7	Master's degree	26	19.1	91.9
8	Master's degree plus	11	8.1	100.0
9	Ph. D. or equivalent	<u>0</u>	<u>0.0</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>5.60</u>	Mode <u>6.00</u>	Median <u>6.00</u>	

Table 60
Sex of Respondent

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	Male	107	78.7	78.7
2	Female	<u>29</u>	<u>21.3</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
Mean <u>1.21</u>		Mode <u>1.00</u>	Median <u>1.00</u>	

Appendix E: SPO Managerial Influence Frequency Data

Table 61

Managerial Influence over Technical Details of Project Work

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	My PM dominates	11	8.1	8.1
2	Mostly my PM	6	4.4	12.5
3	PM somewhat more than FM	18	13.2	25.7
4	About the same	28	20.6	46.3
5	FM somewhat more than PM	32	23.5	69.9
6	Mostly my FM	30	22.1	91.9
7	My FM dominates	<u>11</u>	<u>8.1</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>4.46</u>	Mode <u>5.00</u>	Median <u>5.00</u>	

Table 62

Managerial Influence over Future Work Assignments

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	My PM dominates	7	5.1	5.1
2	Mostly my PM	3	2.2	7.4
3	PM somewhat more than FM	18	13.2	20.6
4	About the same	23	16.9	37.5
5	FM somewhat more than PM	34	25.0	62.5
6	Mostly my FM	23	16.9	79.4
7	My FM dominates	<u>28</u>	<u>20.6</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>4.86</u>	Mode <u>5.00</u>	Median <u>5.00</u>	

Table 63

Managerial Influence over Appraisal Ratings

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	My PM dominates	7	5.1	5.1
2	Mostly my PM	1	0.7	5.9
3	PM somewhat more than FM	3	2.2	8.1
4	About the same	4	2.9	11.0
5	FM somewhat more than PM	10	7.4	18.4
6	Mostly my FM	28	20.6	39.0
7	My FM dominates	<u>83</u>	<u>61.0</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>6.13</u>	Mode <u>7.00</u>	Median <u>7.00</u>	

Table 64

Managerial Influence over Technical Quality of Project Work

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	My PM dominates	9	6.6	6.6
2	Mostly my PM	5	3.7	10.3
3	PM somewhat more than FM	3	2.2	12.5
4	About the same	8	5.9	18.4
5	FM somewhat more than PM	14	10.3	28.7
6	Mostly my FM	30	22.1	50.7
7	My FM dominates	<u>67</u>	<u>49.3</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>5.73</u>	Mode <u>7.00</u>	Median <u>6.00</u>	

Table 65

Managerial Influence over Salaries/Promotions

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	My PM dominates	5	3.7	3.7
2	Mostly my PM	2	1.5	5.1
3	PM somewhat more than FM	3	2.2	7.4
4	About the same	2	1.5	8.8
5	FM somewhat more than PM	4	2.9	11.8
6	Mostly my FM	20	14.7	26.5
7	My FM dominates	<u>100</u>	<u>73.5</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>6.37</u>	Mode <u>7.00</u>	Median <u>7.00</u>	

Table 66

Managerial Influence over Project Work Hours

<u>Code</u>	<u>Category</u>	<u>Frequencies</u>		
		<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>
1	My PM dominates	11	8.1	8.1
2	Mostly my PM	3	2.2	10.3
3	PM somewhat more than FM	12	8.8	19.1
4	About the same	32	23.5	42.6
5	FM somewhat more than PM	27	19.9	62.5
6	Mostly my FM	28	20.6	83.1
7	My FM dominates	<u>23</u>	<u>16.9</u>	100.0
	TOTAL	<u>136</u>	<u>100.0</u>	
	Mean <u>4.74</u>	Mode <u>4.00</u>	Median <u>5.00</u>	

Table 67

Managerial Influence over Project Work Deadlines

<u>Frequencies</u>					
<u>Code</u>	<u>Category</u>	<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>	
1	My PM dominates	14	10.3	10.3	
2	Mostly my PM	16	11.8	22.1	
3	PM somewhat more than FM	25	18.4	40.4	
4	About the same	29	21.3	61.8	
5	FM somewhat more than PM	24	17.6	79.4	
6	Mostly my FM	17	12.5	91.9	
7	My FM dominates	<u>11</u>	<u>8.1</u>	100.0	
	TOTAL	<u>136</u>	<u>100.0</u>		
Mean	<u>3.94</u>	Mode	<u>4.00</u>	Median	<u>4.00</u>

Table 68

Overall SPO Managerial Influence

<u>Frequencies</u>					
<u>Code</u>	<u>Category</u>	<u>Absolute</u>	<u>Adjusted (%)</u>	<u>Cumulative (%)</u>	
<1.5	My PM dominates	3	2.2	2.2	
<2.5	Mostly my PM	3	2.2	4.4	
<3.5	PM somewhat more than FM	6	4.4	8.8	
<4.5	About the same	11	8.8	16.9	
<5.5	FM somewhat more than PM	51	37.5	54.4	
<6.5	Mostly my FM	48	35.3	89.7	
>6.5	My FM dominates	<u>14</u>	<u>10.3</u>	100.0	
	TOTAL	<u>136</u>	<u>100.0</u>		
Mean	<u>5.18</u>	Mode	<u>5.57</u>	Median	<u>5.29</u>

Appendix F: Simple Linear Regression of Power Bases

Simple Linear Regression of Project Manager
Effectiveness with Reward Power

Dependent Variable: Project Manager Effectiveness
Independent Variable: Project Manager's Reward Power

Multiple R	.07385	F = .71830
R Square	.00545	Signif F = .3982
Adjusted R Square	-.00214	
Standard Error	.66835	

Variables in Equation

Variable	B	SE B	Beta	t	Sig t
PMREWARD	-.057155	.067438	-.073846	-.848	.3982
(Constant)	5.316050	.166203	---	31.985	.0000

Simple Linear Regression of Project Manager
Effectiveness with Coercive Power

Dependent Variable: Project Manager Effectiveness
Independent Variable: Project Manager's Coercive Power

Multiple R	.06440	F = .55382
R Square	.00415	Signif F = .4581
Adjusted R Square	-.00334	
Standard Error	.70935	

Variables in Equation

Variable	B	SE B	Beta	t	Sig t
PMCOERCE	-.053461	.071838	-.064395	-.744	.4581
(Constant)	5.253393	.127610	---	41.167	.0000

Simple Linear Regression of Project Manager
Effectiveness with Legitimate Power

Dependent Variable: Project Manager Effectiveness					
Independent Variable: Project Manager's Legitimate Power					

Multiple R	.01083				
R Square	.00012		F =	.01559	
Adjusted R Square	-.00740		Signif F =	.9008	
Standard Error	.71078				

Variables in Equation					
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Variable	B	SE B	Beta	t	Sig t
PMLEGIT	.013313	.106620	.010827	.125	.9008
(Constant)	5.130636	.321133	---	15.977	.0000

Simple Linear Regression of Functional Manager
Effectiveness with Expert Power

Dependent Variable: Functional Manager Effectiveness					
Independent Variable: Functional Manager's Expert Power					

Multiple R	.19373				
R Square	.03753		F =	5.14704	
Adjusted R Square	.03024		Signif F =	.0249	
Standard Error	1.38693				

Variables in Equation					
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Variable	B	SE B	Beta	t	Sig t
FMEXPERT	-.259596	.114425	-.193725	-2.269	.0249
(Constant)	5.103351	.405117	---	12.597	.0000

Simple Linear Regression of Functional Manager
Effectiveness with Referent Power

Dependent Variable: Functional Manager Effectiveness Independent Variable: Functional Manager's Referent Power					
Multiple R	.42083	F = 28.40824			
R Square	.17710	Signif F = .0000			
Adjusted R Square	.17087				
Standard Error	1.28244				
Variables in Equation					
Variable	B	SE B	Beta	t	Sig t
FMREFER	-.415563	.077968	-.420832	-5.330	.0000
(Constant)	5.221380	.217242	---	21.035	.0000

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This research developed and validated new measures of power, based on the widely accepted framework proposed by French and Raven (1959). A review of the literature revealed that previous field studies employing the French and Raven power taxonomy suffer from several methodological limitations -- no power base measures currently exist with adequate reliability and validity. A list of desirable psychometric properties was assembled from several sources, and a well-planned, detailed program of item development and scale testing was carried out to assure that the newly developed measures would possess the desired properties.

Five theoretical construct definitions were developed for reward, coercive, legitimate, expert, and referent powers, based on French and Raven's work. Next, items were generated for each power base that were consistent with the theoretical power definitions. The resultant items were then subjected to a three-phase pilot study to determine those most suitable for further examination. The retained items were next administered, along with various dependent variables, to a sample of project personnel working in matrix organizations. Respondents were asked to describe the behavior of their functional and project managers in terms of the power scales.

Responses from the sample were submitted to four evaluations. First, an assessment of the structure of the new scales was conducted, employing factor analyses, to evaluate the degree of congruency between respondent perceptions and the scales to which items were theoretically assigned. Next, item analyses and internal consistency reliability analyses were carried out to eliminate items which lowered the reliabilities of the new scales. Power scale independence was then assessed by intercorrelating the scales and employing further factor analyses. Finally, the empirical and nomological validity of the new power measures were assessed by performing simple and partial correlation and regression analyses with several dependent variables. The newly developed power scales demonstrated strong psychometric properties.

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