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THE DIMENSIONALITY AND EFFECTIVENESS OF INFLUENCE METHODS USED IN A MATRIX ORGANIZATIONAL ENVIRONMENT

THESIS

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Captain USAF

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AFIT/GSM/SM/77S-10

THE DIMENSIONALITY AND EFFECTIVENESS OF INFLUENCE METHODS USED IN A MATRIX ORGANIZATIONAL ENVIRONMENT

THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology
Air University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science

by

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Capt USAF
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September 1977

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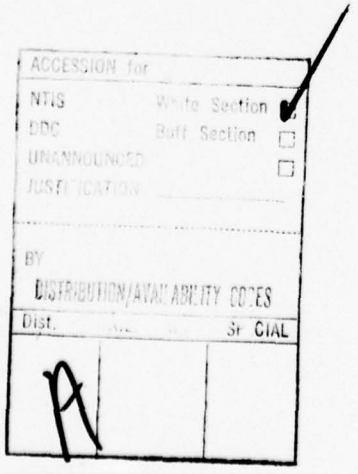
Preface

This thesis is an attempt to expand the knowledge of management practices used in matrixed organizations. Its purpose is to provide a better understanding of the independence and effectiveness of influence methods used in Air Force Matrix Organizations. Since the matrix organization is used throughout industry and government in development, an understanding of power and influence within such an environment is highly important. Hopefully the results of this effort will be useful to both those working in a matrix organization, and to those with a theoretical interest.

I would like to thank Dr. Michael J. Stahl for his enthusiastic support and advice which were a tremendous asset throughout this effort, to Dr. T. Roger Manley and Dr. Raymond H. Klug for the wealth of background material they provided, and to my wife, Terry, for her continuous support and typing assistance. This gratitude also extends to the many individuals who took time from their busy schedules to provide the data for this thesis. Without their forthright and candid answers, this effort would not have been possible.



Richard C. Leclaire

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Abstract

The matrix organization generates authority ambiguity whereby there is multiple supervision of project personnel. Further, the project manager has much less authority than responsibility. To compensate for this, a variety of influence methods are used. The purpose of this study is to investigate the independence and the effectiveness of the influence methods used by project and functional managers in the matrix organizational environment.

To accomplish this, 264 personnel answered a questionnaire. These personnel were in six different System Program Offices at Wright-Patterson Air Force Base. The questionnaire dealt with six different effectiveness variables and ten influence methods, and the responses were subjected to a statistically based multivariate analysis.

Three independent influence dimensions were observed. The first dimension may be viewed as Personal influence, the second as Reward influence and the third as Pressure influence. Use of Personal influence is positively related to Job Satisfaction and Responsiveness, and the use of Reward influence is positively associated with Responsiveness.

The use of pressure influence is negatively associated with Job Satisfaction. Further, the influence methods most closely associated with increased Job Satisfaction and Responsiveness are providing challenging work, being an expert in the field, and acting in a manner people admire and respect. The use of influence methods and dimensions have

little relationship with Work Involvement and Willingness to Disagree.

THE DIMENSIONALITY AND EFFECTIVENESS OF INFLUENCE METHODS USED IN A MATRIX ORGANIZATIONAL ENVIRONMENT

I. The Research Problem

Introduction

The matrix organization is used throughout industry and government in development programs. This structure provides many advantages over the more traditional line or line and staff organizations. It provides the flexibility to handle the interrelated and rapidly changing problems encountered in a development project (Davis, 1977). A more balanced form of organization is present and it tends to combine technical expertise with broad, problem-solving capabilities. It does, however, generate authority ambiguity (two or more managers having authority in the same area) (Goodman, 1967). Further, unlike the functional manager (individual responsible in a specific area), the project officer (individual responsible for the accomplishment of a specific objective) has much less authority than responsibility. To compensate for this, a number of influence methods have been used by managers to elicit the required work on schedule. It is the influence methods used by managers in

project management that is the subject matter of this study.

This chapter discusses various aspects of the research problem with which this study is concerned. First, the statement of the problem is presented. This is followed by the background of the problem which develops the key issues associated with the study. Next, current knowledge, past research, and the importance of the present study is discussed. Finally, the chapter concludes with the specific objectives, assumptions, and limitations of this effort.

Statement of the Problem

A body of literature has been developed to study influence methods. The most influential of these papers, and the one upon which many of the others are based, is "The Bases of Social Power" by J. R. French, Jr. and B. Raven. These authors identify five separate power bases as sources of influence. They are: Legitimate Power, Reward Power, Coercive Power, Expert Power and Referent Power. This report is primarily a literature search of the subject and a collation of the work done by many other authors.

Neither French and Raven nor any of the subsequent papers in the area, so far reviewed, attempted to demonstrate the independence of the five variables. Further, the most recent reviewed by this author, "A Study of Influence Methods Used by Project and Functional Managers in a Matrix Organizational Environment" by L. J. Melhart, Jr., has extended from five to nine the sources for influence of managers.

The problems of this study are to investigate the

independence and effectiveness of influence methods used in project management.

Importance of the Study

Modern development projects involve interrelated and rapidly changing tasks. The matrix organizational form provides the potential for the effective and efficient problem solving necessary in such an environment. But the structure is not a sufficient condition for such problem solving. Human relations must also be considered.

Clearly, as Likert states in "The Nature of Highly Effective Groups", if a group has disruptive emotional stresses, it may be necessary to solve these problems before it can go forward and solve its group task constructively (Likert, 1974: 200). Therefore an understanding of power and influence is highly important. For "...a man who is consciously concerned about working out the proper channels of influence is surely better able to contribute to group goals than a man who neglects or represses power problems and lets working relationships grow up higgedly-piggledy" (McClelland, 1974: 166).

Since the matrix organizational form is so widely used throughout industry and government, an understanding of power within such an environment should enhance the ability of Project and Functional Managers to influence work.

Further, the portion of the research dealing with the independence of influence methods has a theoretical importance by verifying or denying the base of a significant body of

management literature.

Background of the Problem

Organizing Concepts and Structure. Organizing is one of the four functions of management (Terry, 1972: 6). It is the grouping of people and functions to accomplish specific objectives. A structure or framework is provided around which people can unite their efforts (Terry, 1972: 197-199).

There are a number of good organizational structures. The one selected should be developed to most efficiently and effectively accomplish the specific objectives, taking into account such things as technology, the environment, the individual workers and the size of the organization (Porter, Lawler and Hackman, 1975: 271). For example, the "best" organizational structure for an F-4 Tactical Fighter Squadron will be different from that of a System Program Office (SPO), responsible for developing a new fighter aircraft, such as the F-16.

There are two basic forms of structure involved in the matrix organization. These are the functional form and the project form.

The functional form is based upon the division of labor and specialization. It exhibits vertical authority relationships with authority delegated downward (Cleland and King, 1968: 141). For example, Figure 1 depicts a typical functional organization. The engineering chief is responsible for all engineering support throughout the organization, the testing chief is responsible for testing

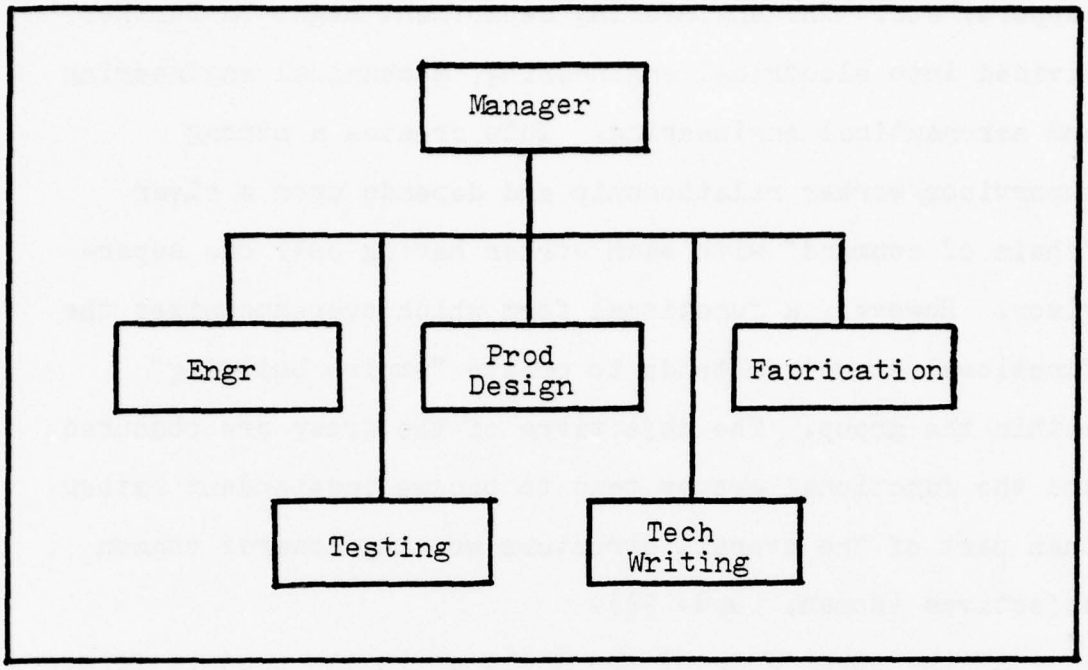

Figure 1. Functional Organization

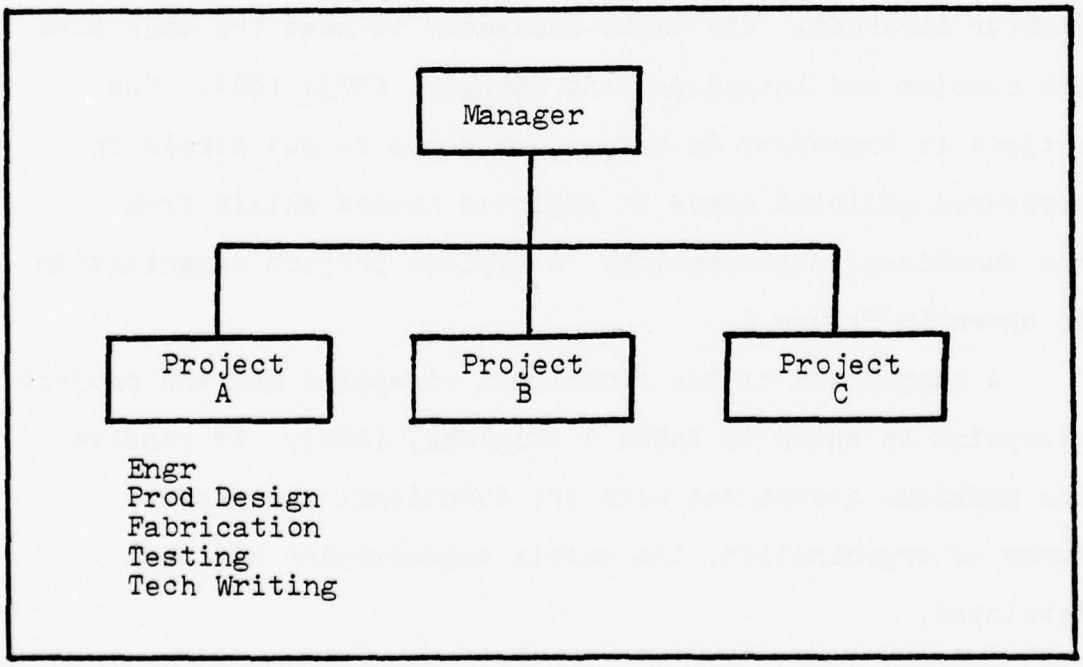

Figure 2. Project Organization

support, etc. The engineering department might be further divided into electrical engineering, mechanical engineering and aeronautical engineering. This creates a strong supervisor/worker relationship and depends upon a clear "chain of command" with each worker having only one supervisor. However, a functional form which overemphasizes the functional structure tends to create "empire building" within the group. The objectives of the group are obscured and the functional groups tend to become independent rather than part of the overall structure working towards common objectives (Roman, 1968: 92).

At the other side of the spectrum is the project form. This is a team assigned to accomplish a specific objective, such as the development and procurement of the F-16 Tactical Fighter Aircraft. The tasks necessary to meet the objective are complex and interdependent (Manley, 1975: 180). The project is transient in nature and tends to put strain on personnel policies since it depletes needed skills from the functional organization. A typical project organization is shown in Figure 2.

A comparison of the functional viewpoint and the project viewpoint is shown in Table I (Cleland, 1966). To resolve the problems associated with the functional and project forms of organization, the matrix organization has been developed.

The Matrix Organization. This type of organization takes the vertical organization used by the functional

Table I* Comparison of the Functional and the Project Viewpoints

Phenomena	Project Viewpoint	Functional Viewpoint
Line-staff organizational dichotomy	Vestiges of the hierarchial model remain, but line functions are placed in a supportive position. A web of authority and responsibility relationships exists.	Line functions have direct responsibility for accomplishing the objectives: line commands and staff advises.
Superior-subordinate relationship	Peer-to-peer, manager-to-technical-expert, associate-to-associate, etc., relationships are used to conduct much of the salient business.	This is the most important relationship; if kept healthy, success will follow. All important business is conducted through a pyramiding structure of superiors and subordinates.
Organizational objectives	Management of a project becomes a joint venture of many relatively independent organizations. Thus the objective becomes multilateral.	Organizational objectives are sought by the parent unit (an assembly of sub-organizations) working within its environment. The objective is unilateral.
Unity of direction	The project manager manages across functional and organizational lines to accomplish a common interorganizational objective.	The general manager acts as the one head for a group of activities having the same plan.

*From David I. Cleland, "Understanding Project Authority," Business Horizons, (Spring, 1966).

departments and overlays the project structure with its horizontal and diagonal relationships (Figure 3). This permits managers and project officers to work directly with the appropriate functional workers without going through the chain of command (Davis, 1977: 344). This yields a number of advantages and disadvantages. It provides the flexibility to handle the interrelated problems encountered in a development project. A more balanced form of organization is present and it tends to combine technical expertise with broad problem solving capabilities. It gives the parent organization the means to retain and develop the specialized functional skills while providing the resources necessary to accomplish the project (Melhart, 1976: 7). At the same time, the individual worker is allowed to keep his attention

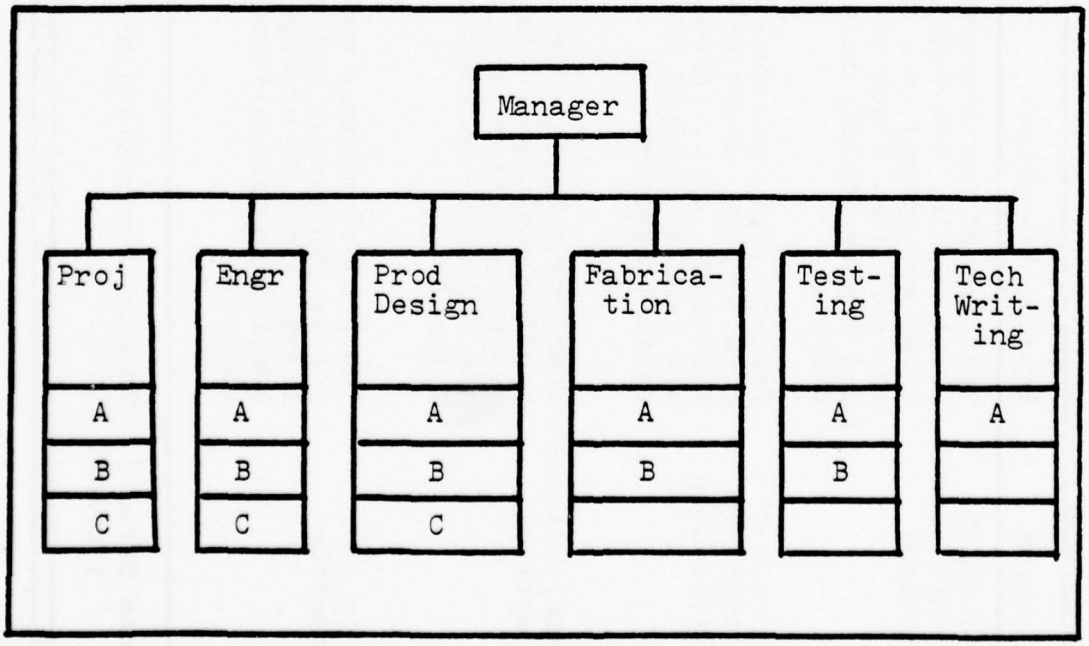

Figure 3. Matrix Organization

on one project (Porter, Lawler, and Hackman, 1975: 256). It does, however, generate authority ambiguity with areas of overlapping authority (dual authority). Multiple roles for people are required and may cause frustration and insecurity. There is conflict and the necessity for control and co-ordination is increased (Davis, 1977: 346).

Authority Ambiguity. The task of giving formal authority to the project officer in a matrix structure is one of the major problem areas. "Empirical studies have shown that attempts to specify the division of authority between project and functional managers has been largely unsuccessful and frequently at odds with effective project decision making" (Lucas, 1973: 102). Clayton Reeser indicated in a 1969 study of aerospace firms using the matrix organizational form, that the biggest problem encountered was that the permanent members of the functional departments did not know who their boss really was (Reeser, 1969: 462). Further, Richard Goodman did a study within industry which indicated that functional managers and project managers did not agree on who had authority to make a given decision. For example, on some decisions, the majority of the project managers believed they had authority to make a final decision, while a majority of the functional managers did not believe project managers had such authority (Goodman, 1967: 396-401). Similar findings were presented for a number of projects within the United States Air Force (Montonaga, 1970).

It is clear from these and other studies that authority ambiguity does exist within organizations using matrix

management. This does not mean that the problem cannot be resolved. Rather, each manager must be educated to the existance of such ambiguity and must employ other methods of influence to elicit work.

Influence Methods. People usually view the exercise of power very negatively. Power , however, has a positive side. People cannot help influencing each other. It is necessary to work out influence relationships which permit a group to reach its objectives. An understanding of influence and power is surely helpful in reaching group goals (McClelland, 1974: 166).

Katz and Kahn (1966) have defined influence as effecting another person's behavior, opinion, attitude or actions. Power is the potential for influence based upon some source (Katz and Kahn, 1966: 220). French and Raven have developed a typology which identified five possible power bases as sources which a manager could use to influence a worker. These bases are: Legitimate Power, Reward Power, Coercive Power, Expert Power, and Referent Power (French and Raven, 1959: 264). In a 1974 study of a large electronic company, Thamhain and Gemmill identified two additional bases: personal friendship and work challenge. They also divided Reward Power into three separate categories: the ability to influence salary, promotion and future work assignments (Thamhain and Gemmill, 1974: 219). Melhart developed a distinction between formal authority to direct and the position and responsibilities inherent in the managers job (Melhart, 1976: 36).

These ten power bases are available in varying degrees to either the project manager or the functional manager and may be used in varying degrees. All of these power bases are considered from the worker's viewpoint since "...individual motive is necessarily an internal, personal, subjective thing" (Barnard, 1938: 85). The definitions for Legitimate, Reward, Coercive, Expert and Referent Power which follow are based upon French and Raven's (1959) original definitions.

Legitimate Power is based upon the worker's perception of the manager as an individual officially empowered to direct him. This power is derived from the worker's perception that authority has been delegated to the manager, and the worker has an obligation to obey. In the matrix organization, this Legitimate Power is split between the project manager and the functional manager, but may be ambiguously defined.

Reward Power is developed from the worker's perception that the manager can provide (a) positive incentive(s). These may be direct and obvious rewards such as directly providing salary increases, promotion or desireable work assignments. They may also be indirect as when a manager, while not empowered to provide such rewards, influences the people who can. The rewards may also be intangible such as a "pat on the back" for a job well done.

Coercive Power is the opposite of reward power and is based upon the belief that the manager will punish the worker if he fails to comply with an influence attempt. It may also be direct or indirect. It is difficult to make a clear distinction between reward and punishment. If the withdrawal

of a reward is considered a punishment by the worker, Coercive Power has been used (Nord, 1971: 359-360). The answer lies in the worker's viewpoint.

Expert Power is based upon the worker's belief that the manager has special knowledge or expertise. This may be based upon technical background, position in the organization or managerial skill. The worker must feel that this expertise is relevent to the project and is used within the organization structure. Experience and formal education are also qualities which may define the manager as an expert.

Referent Power, the last of the French and Raven typology, is the most difficult to define. It is based upon the worker's identification of the manager as an attractive person. It may be based upon friendship, hero worship, the success of the manager or something not even recognized by the worker. It does not have to be reciprocal and is the most difficult to measure. It may be related to Expert Power, and Thamhain and Gemmill lumped together the two power bases in their survey. They used the statement "I respect him and place confidence in his special knowledge and advice" to measure both methods of influence used by managers to gain support.

Thamhain and Gemmill also considered two other power bases. From interviews with project managers, they concluded that the establishment of a personal friendship between the worker and the manager was a source of influence the manager could use to gain support. They also concluded that the manager could influence the worker by providing tasks which

were professionally challenging.

Finally, Melhart concluded that a source of power was the worker's recognition of the position and responsibilities of the manager. Within the matrix organization this source is especially applicable because the project officers frequently do not have the formal authority to direct, which usually implies the lack of Legitimate Power. (However, the project officer does have a responsibility to insure the work is done.)

Since the project managers and functional managers relate to the workers from different viewpoints, it would appear that the same technique of interacting with the worker should have a different impact. The project manager generally does not have formal authority to direct workers, so such a method would not have the same impact as that method used by the functional manager.

Current Knowledge and Past Research

These influence methods appear to break into two general categories: organizationally determined power bases and individually determined power. That is, the organization to a large extent determines the amount of Reward Power, Legitimate Power, Coercive Power and position and responsibilities available. The particular manager determines his own Expert Power, Referent Power, personal friendship and work challenge bases.

The organizationally derived bases, as a category, do not appear to be that effective. Coercive Power is not

effective for either the project or functional managers. Bachman, Bowers and Marcus studied 148 organizations and found it to be the least prominent reason for compliance, and negatively related to effectiveness (Bachman et al, 1968: 236). Thamhain and Gemmill found similar negative results (1974) as did Ivancevich and Donnelly (1970). Reward Power seems to be slightly more effective according to these studies. It appears to be of intermediate importance as a reason to comply with a manager's requests, but there is no clear relationship to effectiveness. Legitimate authority which may use reward or coercive power, is a major reason for compliance by workers. It is not, however, positively related to effective work outcomes or other variables such as Job Satisfaction or Work Involvement. This would indicate that the project manager should not be concerned about not having legitimate authority. Melhart's data indicated that position and responsibility were the most important reasons the workers gave for complying with both types of manager. There was a positive correlation with the degree of support given functional managers. This correlation was also shown with project managers. In sum, these factors do not appear to be particularly useful for managers, and should not be emphasized.

On the other hand, individually determined power does appear to be useful. Expertise has been consistently and strongly correlated with satisfaction and performance. (Thamhain and Gemmill,1974, Bachman, Bowers and Marcus, 1968, and Ivancevich and Donnelly , 1970). Referent power has

been positively correlated with performance (Ivancevich and Donnelly, 1970) even though it is of only intermediate value as a reason for compliance with a supervisor (Bachman, Bowers and Marcus, 1968). Friendship has not been shown to have a relationship with effectiveness or compliance (Melhart, 1976 and Thamhain and Gemmill, 1974). Work challenge is a variable which the managers can influence. Differences in work assignments to meet personal preferences can greatly enhance job satisfaction and effectiveness (Thamhain and Gemmill, 1974: 223).

In spite of this past research, a number of problems remain which inspired the present research. The independence and empirical basis of this dual based typology have not been shown. The question still remains as to the dimensionality of the functional and project managers' influence within a matrix organizational environment. Stahl and Dunne (1977) have done an analysis based upon interviews with forty-nine project personnel. They found three dimensions for project managers and three dimensions for functional managers. For the project manager, the first dimension may be viewed as a Reward/Penalty influence dimension. It includes direct and indirect influence on performance ratings, influence on future work assignments, and the application of pressure or penalties. The second dimension is labeled Personal influence and includes expertise, friendship, professional challenge and responsibility. The third dimension is Friendly, Informal influence and includes friendship and the lack of formal authority. The first two functional manager influence

dimensions are strikingly similar to the first two project manager influence dimensions and are labeled in the same fashion. The first dimension is a Reward/Penalty influence dimension and the second is Personal influence. The third dimension is different from the third project manager influence dimension: Formal Authority and Position.

This work, along with Melhart's provides the basis for this study. It is hoped that a large data base of approximately 200 will be adequate for a truly valid, statistically based multivariate analysis of influence methods. In contrast, Thamhain and Gemmill used 66 data points and Stahl and Dunne used 49. Further, there is no clear distinction in the empirical literature between the possession of an influence source as power and the use of an influence source as an influence method or style. On the other hand, the theoretical literature of French and Raven (1959) and Katz and Kahn (1966) makes such a distinction. This study focuses on the use of influence source in determining dimensionality and effectiveness in project management.

Specific Objectives of the Study

The research attempts to accomplish the following objectives:

1. Determine if the uses of the five bases of power defined by French and Raven are independent. This is done for use of these bases by the project manager and for use by the functional manager.
2. Determine a list of independent influence dimensions for project managers from the ten listed earlier.

3. Determine a list of independent influence dimensions for functional managers from the ten listed earlier.

4. Determine the association between the use of the independent influence dimensions with effectiveness for both the project and functional managers.

5. Determine the relationship between the use of all the influence methods with effectiveness for both the project and functional managers.

Assumptions and Limitations of the Study

The assumptions made in this study are as follows:

1. Each respondent to the survey answered the questions truthfully, in terms of his own perceptions.

2. The individuals surveyed represent an unbiased sample of the population surveyed.

3. The population is representative of System Program Offices in the Aeronautical Systems Division.

The limitations of the study are as follows:

1. The survey is limited to six System Program Offices located at Wright-Patterson Air Force Base, Ohio.

2. The survey sample for this study is limited to 264 project personnel.

3. The number of influence methods is limited to ten.

4. The number of effectiveness variables is limited to four.

II. Research Methodology

Introduction

To accomplish the objectives of this study, perceptions of the degree of use of various influence methods (Reward, Expertise, etc.) were measured. This was done by providing questionnaires to project personnel (non-supervisory, non-secretarial workers). These individuals generally worked with both project managers and functional managers, since their organizations used the matrix organizational form. The data was statistically analyzed to determine if the use of the different influence methods was independent, and to determine the relationship with several effectiveness variables.

The research methodology used in collecting and analyzing the data is presented in this chapter. The first section deals with the scope of the inquiry, followed by a discussion of the data collection and the questionnaire. The chapter ends with an explanation of the statistical techniques used in the research.

Scope of the Inquiry

This portion of the study was conducted during May, 1977 at Wright-Patterson Air Force Base, Ohio (WPAFB). Selected personnel from six System Program Offices (SPOs) were surveyed. The SPOs were chosen to provide a cross-

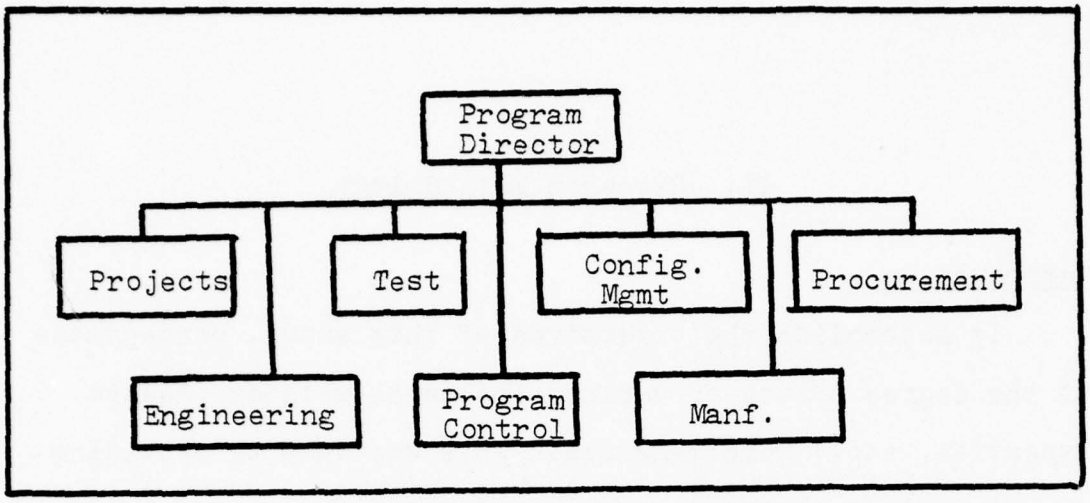

Figure 4. Typical System Program Office organization.

section of the SPOs at WPAFB. All of the SPOs are involved in equipment acquisition.

The System Program Offices visited were generally structured as shown in Figure 4. The System Program Director has overall responsibility for all aspects of the program or programs involved. Reporting to him are deputy directors for various functional areas such as Engineering, Test, Program Control, Configuration Management, Procurement, Integrated Logistics Support and Manufacturing. Further, there is a Director of Projects who has responsibility for various projects related to the overall program. Each project deals with a different aspect of the program and a project manager is assigned to it. A project manager relies on support from personnel within the functional areas to complete project tasks.

Since projects and SPOs within the Air Force deal with a variety of issues, the SPOs chosen for the study effort

range from "Super SPOs" responsible for the development and procurement of an entirely new type of aircraft and all related equipment, to "Basket SPOs" responsible for developing component systems that can be used on a wide variety of aircraft. The size of the organizations ranged from more than 400 personnel to less than 100. Since projects can be related to different phases of the acquisition process, the people surveyed worked on projects ranging from aircraft in the development phase, to parts development for aircraft in the active inventory.

Demographic Information. In order to provide a basis for interpreting the data gathered, demographic information was collected. The sample population was separated into the following work specialties:

Engineering	29.2%
Test and Evaluation	4.4%
Program Control	21.2%
Configuration Management	11.5%
Procurement	18.1%
Integrated Logistics Support	3.1%
Manufacturing	6.2%
Other	6.2%

The education level of the sample was relatively high with 69.9% having at least some graduate level work; 41.2% had at least a master's degree. The individuals had been working for their particular functional manager for at least three months and one individual had been there over 13 years. The average time with a particular functional manager was slightly over two years. They had all worked with their project manager at least three months also, but the average time was less with an average of about 20 months. This is

not particularly surprising since projects are more transient than the functional organization. Eighty of the individuals were military officers and ranged in rank from Second Lieutenant to Lieutenant Colonel with the majority being Captains or Majors. The 146 civilians had a comparable grade range and average.

Determination of Sample Size. In the literature reviewed by the author, no objective method of determining a minimum acceptable sample size for a factor analysis could be found (Harman, 1967). In the absence of such guidelines, and based upon discussions with Dr. Michael Stahl, the following equation was chosen to determine the minimum acceptable sample size(S):

$$S = \frac{n^* (n^* + 1)}{2} = \frac{10 (11)}{2} = 55$$

*n = number of influence methods.

This relationship was chosen based upon the matrix of correlations to be factored. Due to the symmetry of the correlation matrix, there are $n(n+1)/2$ distinct elements. It is clearly preferred to have a sample size substantially larger and therefore a sample of 220, four times the minimum (of 55), was chosen as the goal. Four hundred seventy-five surveys were distributed to insure an acceptable number of responses since there would be a large number of forms either not returned or unacceptable for some other reason. Of the 475 questionnaires distributed, 226 were returned and acceptable, 38 were returned and partially acceptable because

the individuals claimed they did not work closely enough with a project manager to respond to those questions, 28 were returned but rejected due to failure to answer one or more of the questions, and 183 were not returned. The 61.5% response rate was considered acceptable as typical of similar surveys in the past and provided a representative sample of the population.

Data Collection

The data for this study was obtained by providing a twenty-two question questionnaire to project support personnel in six different SPOs. A Questionnaire rather than interview was chosen since the sample was so large, and this lessened the likelihood that a respondent answered as he believed to be socially desireable rather than as he actually felt. In addition, the questionnaire was collected in such a manner as to guarantee the anonymity of the respondents and to alleviate any fears that the individual responses would be made available to supervisory personnel. This permitted respondents to answer without fear of retribution or hope of gain by answering dishonestly.

Questionnaire. (Appendix A). The first four questions were demographic in nature, to define some of the general characteristics of the survey sample. Further, they insured that the respondents had been working with the project and functional managers for an adequate length of time. If an individual had not worked at least three (3) months with his project and functional manager, his answers were discarded.

Questions five through eight dealt with individual Work Involvement and were based upon a set of questions developed by Patchen (Patchen, 1967: 26-29, 48-51). These questions were also used by Thamhain and Gemmill (1974) and Melhart (1976) to correlate Work Involvement with Influence styles. For purposes of analysis, the four Work Involvement questions were each scored from one to five in descending order. The order of responses was reversed on two of the four questions to permit detection of someone who appeared to mark inconsistantly. The Work Involvement score was therefore computed by the equation:

$$WKINV = Q5 + Q6 - Q7 - Q8 + 12$$

The possible range of responses was from 4 to 20 with 4 indicating low Work Involvement and 20 indicating high Work Involvement.

Questions nine through twelve dealt with Job Satisfaction using four (4) questions developed by Hoppock (1935). The Job Satisfaction score was computed in much the same way as Work Involvement with the same reversal of answers present in the questions. The Job Satisfaction score was computed by the equation:

$$JOBSAT = Q10 - Q9 + Q11 - Q12 + 16$$

The possible range of responses was from 4 to 28, with 4 indicating low Job Satisfaction and 28 indicating high Job Satisfaction.

Questions thirteen and seventeen dealt with the influence methods that a manager might use to influence a worker to comply with a request. The respondent was asked to give his

degree of agreement with each of the following ten statements relative to his functional manager and to the project manager with whom he works most closely:

a. He lets me know he has the legitimate right to direct me.

b. He demonstrates special knowledge or expertise.

c. He causes me to respect and admire him as a person.

d. He applies pressure or penalizes me in some way.

e. He rewards me in some way.

f. He influences my performance rating.

g. He influences my future work assignment.

h. He has established a personal friendship with me.

i. He assigns things which are professionally challenging.

j. He lets me know he has responsibilities as the manager.

A seven point scale ranging from strongly disagree to strongly agree was used to provide adequate discrimination between responses (Nunally, 1967: 521). These influence methods were chosen based upon the French and Raven paper, the Melhart research and the author's personal experience. The wording of each possible influence method was chosen to reflect the use of an influence method rather than the possession of such a power base. Further, to allow an analysis of the independence of the French and Raven typology, the wording of parts a - e correspond to that used by French and Raven. Parts f and g were included as these were specific rewards which, in the military/civil service environment, are related to promotion and success. Parts h - j were included

for comparison with Thamhain/Gemmill and Melhart's work.

Questions fourteen and eighteen related to the Responsiveness of the individual to his functional and project manager. The scale used by Melhart, called Degree of Support, was not used because his data was so highly skewed. For example, Melhart reported the overall average score for Degree of Support given to the immediate functional manager as perceived by the project personnel as 4.61 out of a possible 5.00 (SD 0.5). In order to develop more descrimination among respondents to this survey, they were to indicate what percentage of the time they met the manager's requests with maximum efforts. This is further discussed in the next two sections.

Questions fifteen, sixteen, nineteen and twenty measured the respondent's Willingness to Disagree with his functional and project manager. These questions duplicated those used by Melhart, and are based on the work of Patchen (1965:48). They are also similar to those used by Thamhain and Gemmill. The scoring of the measure of Willingness to Disagree was computed by summing questions 15 and 16 for the functional manager and questions 19 and 20 for the project manager.

Question twenty-one, relating to the new OER System, was included to see if similar results to those reported by Melhart were received. Question twenty-two, identification of SPO, was incorporated to insure the data was representative of the total population rather than received from one or two of the SPOs. The names of the actual SPOs have been deleted from Appendix A.

Pretest of the Questionnaire. The questionnaire was pretested by first providing it to seventeen project personnel. These people came from three of the SPOs to be surveyed, and four different functional areas to assure a cross-section of the survey population. The purpose of the pretest was to determine the time required to complete the survey, to evaluate the clarity of the questions, and if necessary, to change the working of any questions to insure they were not ambiguous. In particular, questions fourteen and eighteen were tested to see if the responses were as highly skewed as they were in Melhart's investigation.

Each pretest respondent was given the questionnaire and told that it was a pretest. After completion of the survey they were asked to identify questions they had trouble answering. No significant problems were reported. Further, the answers were not highly skewed for the Responsiveness questions with means of 79.2% and 73.2% for the functional and project managers respectively. The standard deviations were 18.4% and 20.8% respectively. Work Involvement had a mean of 14.0 and a standard deviation of 2.1.

As a result of this pretest, it was decided that the questionnaire was sufficiently clear and unambiguous to proceed with the investigation. Some question remained as to the validity of the Responsiveness questions.

Validating Responsiveness Answers. The measures of Work Involvement, Job Satisfaction and Willingness to Disagree have been used by a number of researchers and validated by others (Patchen,1965, Manley,McNichols and Stahl, 1977).

The Responsiveness measure was new and central to this effort, and in order to validate the Responsiveness answers, eighteen of the individuals were contacted and asked to answer questions fourteen and eighteen again. Assurances were given that the author would be the only person to know what the responses were. At the same time several co-workers of each of the respondents were asked how they felt the individual should have answered the question. Again, assurances of anonymity were provided to alleviate fear that the answers could be used against them. The name of a particular project manager was provided against each individual to insure that the answers were relative to the same individual and therefore comparable. For twelve of the people the author was able to find three co-workers willing to respond and state they felt competent to judge responsiveness based upon actual observation. For the other six people, only two individuals for each respondent were found willing and competent to respond.

The analysis of the results was in two parts. First, an analysis of variance using the Spearman-Browning technique was employed to estimate the reliability of the average rating of the co-workers (Winer, 1971: 283-289). Table II gives the results of this analysis and shows the measure is reliable and internally consistent. Second, to check the validity of the self-reported responsiveness of an individual to his functional and project manager, a Spearman Rank Correlation Coefficient (Yamane, 1973: 499) was calculated between the individuals own rating and the average rating of the

Table II. Reliability of Responsiveness Answers				
Number of raters per individual	Total number of ratings	Reliability of Responsiveness ratings relative to		
		Project Manager	Function. Manager	Overall
3	36	.75	.87	
3	72			.81
2	12	.46	.90	
2	24			.64

co-workers. No specific distribution of variables is assumed in this calculation. The correlation was .90, which is significant for 36 data points at the .01 level.

Methods of Analysis

The analysis of the data involved three mathematical methods to determine relationships. These were:

1. The Pearson Correlation Analysis - a measure of linear relationship between two (2) variables (e.g. the use of expert power and willingness to disagree).

2. Least Squares Regression Analysis - examining the relationship of one variable as a function of one or several other variables (e.g. job satisfaction as a function of expert, referent and coercive influence).

3. Principal Component Analysis (Factor Analysis) with Varimax Orthogonal Rotation - finding the dimensionality of a set of manifestation variables to determine a smaller set of latent or underlying independent variables.

These techniques were performed on the CDC - 6600 computer system at Wright-Patterson Air Force Base. The Statistical Package for the Social Sciences (SPSS) computer program was used to accomplish the analysis. A complete derivation of these analyses techniques is beyond the scope of this paper but is available in a large number of texts. An excellent treatment of Regression Analysis is contained in Applied Regression Analysis by Draper and Smith (1966). Factor Analysis is treated in depth by Harman in his book Modern Factor Analysis, 2nd ed., 1967. Additionally SPSS: Statistical Package for the Social Sciences, 2nd ed. by Nie et al (1975) provides an excellent overview of the analysis techniques used and the assumptions required as well as the actual programming required.

For this study, the number of dimensions based on the Factor Analysis was determined by a critical eigenvalue of 1.00. If there was a correlation greater than 0.5 between the original variable and a new dimension, the original variable was considered part of the dimension.

III. Analysis and Results

Introduction

In the beginning of this thesis, the objectives were stated. They are to investigate the independence and the effectiveness of influence methods used in project management. To accomplish this, the data collected from numerous questionnaires was subjected to statistical analyses.

This chapter presents the results of the statistical analysis. Information on the distribution of the responses received for the different variables is presented first. This is followed by a discussion of the factor analysis employed to determine the dimensionality of the influence methods used in project management. The correlations between the effectiveness variables and the influence dimensions and methods are presented next. The chapter concludes with a discussion of a regression analysis to determine the relationship between the effectiveness variables and the influence styles.

Distribution of Responses

Three categories of variabels were considered in the analysis of the data. The first category is the Effectiveness variables, which includes Job Satisfaction, Work Involvement, Willingness to Disagree (with the Project Manager and with the Functional Manager), and Responsiveness (to the Project

Manager and to the Functional Manager). Table III contains the means and standard deviations for these variables. These variables were chosen since they provide a point of comparison with the work of Thamhain and Gemmill (1974) and Melhart (1976). Further, with the Responsiveness measure included and validated, these variables represent some of the characteristics of an effective working group (Likert, 1974: 189-201). There were no significant differences between the means scores, for the Project Manager and Functional Manager for either the Responsiveness measure or the Willingness to Disagree measure. This contrasts with Melhart (1976: 56) who reported a significant difference between Willingness to Disagree with the Project Manager and Functional Manager. Further, the scores he reported are significantly higher ($p < .01$) than reported here. The differences might be explained by the data gathering techniques.

The other two categories were Influence Styles used by Project Managers and Functional Managers. Table IV contains a test of means of each influence style by type of manager. Those styles with a statistically significant difference in use between Project and Functional Managers are noted. The differences are readily explainable by the nature of the jobs. The Functional Manager generally does have a legitimate right to direct, and a more major influence on Performance Ratings and Future Assignments. The respondents felt more strongly that the Functional Manager assigned challenging work. This may be due to a wider range of assignments he has to give to project personnel, or he may be better able to judge what the

Table III. Distribution of Project Personnel Effectiveness Variables

Attitude	Mean	Standard Deviation
Job Satisfaction	19.72[a]	3.30
Work Involvement	15.00[b]	2.67
Willingness to Disagree		
(with Project Manager)	7.64[c]	2.44
(with Functional Manager)	7.58[d]	2.24
Responsiveness		
(to Project Manager)	80.29	18.81
(to Functional Manager)	80.35	20.40

a. Thompson (1975) reported a mean of 17.7 for Air Force Officers in the same career field and Dunne, Stahl and Melhart (1978) reported a mean of 20.4 (SD 2.9).

b. Thamhain and Gemmill (1974) reported a mean of 14.8 (SD 2.2) and Dunne, Stahl and Melhart (1978) reported a mean of 16.2 (SD 2.5).

c. Dunne, Stahl and Melhart reported a mean of 8.8 (SD 2.3).

d. Dunne, Stahl and Melhart reported a mean of 10.1 (SD 1.8).

Table IV. Test on Means of Influence Styles

Influence Style	Project Manager		Functional Manager	
	Mean	SD	Mean	SD
Legitimate Right	3.98	1.82	4.49**	1.79
Expertise	5.08	1.47	5.22	1.63
Referent	5.10	1.41	5.04	1.63
Coercive	2.67	1.66	2.90**	1.70
Reward	3.66	1.77	4.38**	1.67
Performance Rating	3.93	2.18	5.48**	1.66
Future Work Assignment	3.90	2.01	5.27**	1.59
Friendship	4.23	1.68	4.51	1.62
Challenging Work	4.31	1.68	4.77**	1.60
Responsibilities of Manager	4.80	1.68	4.88	1.68

** $p < .01$ two tailed

Scoring range 1.0 - 7.0 with higher ratings indicating higher use.

individual considers challenging due to proximity.

An interesting comparison can be made between the use of influence styles and the reasons project personnel gave for complying with a manager's requests (Dunne, Stahl and Melhart, 1978). Dunne, et al used a list of influence styles which are somewhat different from that used in this research effort. However, the lists are still comparable and show that project managers are using the influence styles which project personnel say are their reasons for complying with a request (Table V). The relative rankings are very similar with a Spearman Rank Correlation Coefficient of .84 which is significant at the .01 level. For this calculation, the following assumptions were made:

1. The average between indirect and direct ratings as reasons to comply was taken to compare with performance rating as a use of influence.
2. Expertise and Referent were tied together as reasons to comply.
3. The average of indirect ratings, direct ratings and Future Work was taken to compare with Reward as a use of influence.

"Performance Ratings" were not broken into "indirect" and "direct" influence in the present study. Since the Project Manager rarely has direct influence over the performance rating, it is not surprising that "Direct Rating" was not considered a reason for complying. Presumable, if that had been analyzed for its use, it would have come in rather low. The situation is somewhat less explicit for Functional Managers (Table VI) who did not show a significant relationship between the two scales. This may be because part of the job

Table V. A Comparison of the Rankings of the Use of Influence Styles with the Reasons for Complying (Project Manager).

Ranks	Use of Influence Styles[a]	Reasons for Complying[b]
1	Referent (5.10)	Responsibilities of Manager (79)
2	Expertise (5.09)	Expertise/Referent (75)
3	Responsibilities of Manager (4.80)	Challenging Work (62)
4	Challenging Work (4.30)	Friendship (54)
5	Friendship (4.23)	Indirect Ratings (35)
6	Legitimate Right (3.98)	Legitimate Right (25)
7	Performance Ratings (3.93)	Future Work (22)
8	Future Work (3.90)	Coercion (22)
9	Reward (3.66)	Direct Ratings (14)
10	Coercion (2.67)	----------

a. Scoring range 1.0 - 7.0 with higher ratings indicating high use.

b. Scoring range 1 - 100 with higher ratings indicating high importance. Some titles have been slightly modified for comparison with the present study (Dunne, Stahl, Melhart, 1978).

Table VI. A Comparison of the Rankings of the Use of Influence Styles with the Reasons for Complying (Functional Manager).

Ranks	Use of Influence Styles[a]	Reasons for Complying[b]
1	Performance Ratings (5.48)	Responsibilities of Manager (88)
2	Future Work (5.27)	Legitimate Right (85)
3	Expertise (5.22)	Expertise/Referent (81)
4	Referent (5.04)	Direct Ratings (80)
5	Responsibilities of Manager (4.88)	Challenging Work (74)
6	Challenging Work (4.77)	Indirect Ratings (62)
7	Friendship (4.51)	Friendship (58)
8	Legitimate Right (4.49)	Coercion (56)
9	Reward (4.38)	Future Work (55)
10	Coercion (2.90)	----------

a. Scoring range 1.0 - 7.0 with higher ratings indicating high use.

b. Scoring range 1-100 with higher ratings indicating high importance. Some titles have been slightly modified for comparison with the present study (Dunne, Stahl, Melhart, 1978).

requires providing performance ratings and recommendations for future work assignments. Therefore, these influence styles are used even though the manager might prefer to use others. The second area of difference for the Functional Manager involves his responsibilities and legitimate right. These were given as important reasons for complying while they were not used a much as other influence methods. It is possible that possession of the power source is sufficient and need not be used. In general, however, it can be stated that Project Managers used the influence styles which project personnel gave as reasons for complying.

This comparison demonstrates that managers recognize that project personnel have different reasons for complying with Functional and Project managers (Dunne, Stahl and Melhart, 1978) and adapt their behavior to increase their effectiveness in influencing work. While it is beyond the scope of this effort to provide such a discussion for each of the sub-populations involved in this study, Appendix B provides tables giving the means of Project Personnel Effectiveness variables and the means of the influence styles used by managers for the following sub-populations:

A. The Work Specialties (Tables B-I, B-II, B-III).
B. Education level (Tables B-IV, B-V, B-VI).
C. Each Organization Surveyed (Tables B-VII, B-VIII, B-IX).

Dimensionality of the Influence Methods

As stated earlier in this paper, one of the problems studied is the independence or dimensionality of the influence methods used in project management. To determine what smaller

number of orthogonal variables could be employed to describe the influence dimensions which are used, a factor analysis was performed on the data. Since project and functional managers do not have the same power sources available, the factor analysis was performed relative to each separately. A varimax orthogonal rotation was used to aid in interpretation of the results and the number of factors was determined based upon a critical eigenvalue of 1.0. Two separate listings of influence styles were studied. The first of these is the typology developed by French and Raven (1959) involving five influence styles, and the second is the typology developed for this paper involving ten influence styles.

Dimensionality of the French and Raven Influence Methods. The factor analysis of the five influence styles yielded two underlying factors for both project and functional managers. Table VII contains the factor loading matrix after rotation, which shows the patterns of relationships of the original five influence styles contained in the new influence dimensions. These factor loadings are the correlations between the original variables and the new dimensions. Loadings greater than 0.5 are underlined for ease of interpretation. Table C-I in the Appendix provides a listing of the eigenvalues and percentage of variance explained. This factor analysis shows that the same dimensions of influence styles are common to both project and functional managers.

The first dimension may be viewed as an individual influence dimension and is made up of the personal traits

Table VII. Factor Analysis of French and Raven Influence Styles.

Influence Styles	Project Manager		Functional Manager	
	Dimension 1	Dimension 2	Dimension 1	Dimension 2
Legitimate Right	.18	.79	.23	.84
Expert	.88	-.03	.84	.05
Referent	.90	-.09	.90	-.15
Coercive	-.16	.83	-.16	.88
Reward	.63	.40	.66	.15

n = 226

brought to the job (expert and referent), and the use of rewards. The second dimension may be considered the pressure influence dimension and consists of the use of the legitimate right to direct and coercion. These results are different than those hypothesized by Ivancevich and Donnelly (1974) when they stated that French and Raven's five category typology could be reclassified into two distinct groupings: Incremental influence and Organizationally derived influence. They defined Incremental influence as that influence brought to the job by the manager, consisting of expertise and referent influence. They defined organizationally derived influence as that power provided by the organization and consisting of legitimate right, reward and coercion. The two dimensions derived in this thesis explain 70% of the total variance in the data examined. The total base did involve ten variables, however, and the dimensionality of the ten influence styles is also in question.

Dimensionality of the Ten Influence Methods. The factor analysis of the ten influence styles yielded three underlying dimensions for both the project and functional manager. Table VIII contains the factor loadings on the three new dimensions. Table C-II in the Appendix provides a listing of the eigenvalues and percentage of variance explained. As with the French and Raven analysis, the Project manager and the Functional manager have the same influence dimensions. The first dimension, called personal influence, is made up of the use of expertise, referent power, personal friendship and

Table VIII. Factor Analysis of Ten Influence Styles

Influence Styles	Project Manager			Functional Manager		
	D* 1	D 2	D 3	D 1	D 2	D 3
Legitimate Right	-.03	.22	.84	.15	.15	.88
Expertise	.79	.22	.13	.86	.03	.15
Referent	.83	.23	.06	.86	.20	-.08
Coercive	-.44	.34	.50	-.24	.02	.78
Reward	.33	.76	.10	.38	.65	-.00
Performance Ratings	.20	.86	.16	.07	.84	.15
Future Work	.15	.83	.15	.08	.69	.26
Friendship	.62	.24	-.04	.60	.47	-.01
Challenging Work	.51	.57	.20	.57	.58	.05
Responsibility of Manager	.28	.03	.84	.34	.39	.62

*D = Dimension

n = 226

The correlation matrix of the influence styles is contained in Tables C-III and C-IV.

challenging work assignments. The second dimension called the reward influence, consists of using rewards, influencing performance ratings and future work and being a friend. The third dimension is a pressure influence style involving the use of penalties and letting subordinates know of the manager's legitimate rights and responsibilities. The project personnel see performance ratings, a device potentially able to reward or punish an individual, as a device for reward. Further, they consider reminders of a manager's legitimate right to direct, or his responsibilities, a technique to pressure them.

These results are different from those reported by Stahl and Dunne (1977). It is presumed that the differences can be explained by the fact that this study distinguishes between use of an influence style and its possession, and uses a slightly different set of influence styles. While these results are of theoretical interest, the working manager is more interested in the effectiveness of a given influence style.

Effectiveness of Influence Methods

The relationship between the use of these independent influence dimensions and worker effectiveness is clearly important in determining what influence dimension to use. Table IX contains the correlations among influence dimensions and the effectiveness variables. As can be seen from the table, personal influence is positively associated with responsiveness to both types of managers. For the Functional manager it is also positively correlated with Job Satisfaction.

Table IX. Correlations Among Influence Dimensions and Effectiveness Variables.

Influence Dimension	Job Satisfaction		Work Involvement		Responsiveness		Willingness to Disagree	
	PM[a]	FM[b]	PM	FM	PM	FM	PM	FM
Personal Influence	.11	.28**	-.02	.12	.36**	.34**	.04	.12
Rewards	.12	-.05	.04	.16*	.13*	.20**	-.13*	.09
Pressure	-.21**	-.20**	.05	.04	-.04	.09	-.07	.01

a. Project Manager
b. Functional Manager
** $p < .01$ two tailed
* $p < .05$ two tailed

Table X. Correlations Among Influence Methods and Effectiveness Variables

Influence Method	Job Satisfaction		Work Involvement		Responsiveness		Willingness to Disagree	
	PM[a]	FM[b]	PM	FM	PM	FM	PM	FM
Legitimate Right	-.12	-.10	.05	.11	-.03	-.02	-.13*	.09
Expertise	.04	.18**	-.06	.06	.32**	.26**	-.07	.11
Referent	.06	.24**	-.01	.11	.31**	.37**	-.04	.10
Coercive	-.19**	-.25**	.02	-.02	-.18**	-.15*	-.01	-.07
Reward	.10	.09	.04	.23**	.19**	.28**	-.03	.12
Performance Rating	.09	-.06	.06	.10	.22**	.19**	-.19**	.06
Future Work	.06	-.09	-.02	.07	.17**	.11	-.19**	.10
Friendship	.04	.09	-.03	.12	.20**	.28**	.09	.11
Challenging Work	.21**	.20**	.11	.21**	.24**	.28**	.06	.11
Responsibilities of Manager	.14*	-.05	.06	.14*	.10	.18**	-.04	.09

a. Project Manager

b. Functional Manager

** $p < .01$; * $p < .05$ (both two tailed)

Rewards are also positively correlated with responsiveness for both types of manager, though to a lesser degree than personal influence. Pressure is negatively correlated with Job Satisfaction for both types of manager.

Perhaps of more interest to a manager is a particular influence style's relationship to effectiveness, rather than the impact of the general influence dimension. Table X shows the correlations among influence styles with the effectiveness variables. From this table, a manager could determine the association between his use of a particular influence style and the effectiveness variables. The results have an intuitive appeal, and show some relationships which are lost in Table IX. For example, a project manager's use of the pressure dimension shows no significant correlation with responsiveness, but the use of the coercive influence style does have a significant negative correlation with responsiveness. The functional manager's use of the personal influence dimension has a .34 correlation with responsiveness while his use of referent power alone has a correlation of .37. Clearly the effective manager should know not only what influence dimensions (sum of the influence methods) are effective, but also what aspects of a particular dimension to use. The tables also show that the functional manager's behavior has a much stronger correlation with a worker's Job Satisfaction and Work Involvement than a project manager's. (This analysis assumes that an individual works in a matrix organizational form and works with both functional and project managers.) The correlation matrix for the effectiveness

Table XI. Distribution and Test[1] of Means of Responses by those individuals working only with a Functional Manager.

Variable	Mean	SD
Effectiveness		
Job Satisfaction	18.84	3.59
Work Involvement	15.00	3.05
Willingness to Disagree	7.97	1.99
Responsiveness	78.76	20.63
Influence Methods		
Legitimate Right	4.97	1.72
Expertise	5.18	1.75
Referent	5.34	1.46
Coercive	2.95	1.82
Reward	4.87	1.53
Performance Rating	6.13**	1.42
Future Work	5.08	1.79
Friendship	4.55	1.87
Challenging Work	4.92	1.46
Responsibilities of Manager	5.03	1.57

**p < .01 two tailed, n = 38

1 Means compared with those of 226 individuals working for both Project and Functional Managers.

variables is contained in Table C-V.

As was stated earlier in this effort, 38 responses were received from individuals who reported that they did not work closely enough with any project manager to respond to those questions. Clearly these individuals are not subjected to the same authority ambiguity as those individuals who work with both project and functional managers, even though they work in the same organization. Table XI shows the distribution of these responses to the effectiveness variables and the influence styles used by functional managers. The only variable for which there is a statistically significant difference between these individuals and the 226 project personnel is the measure of the manager's influence on performance rating. This implies that authority ambiguity does not significantly deteriorate effectiveness of the influence styles used by functional managers within an organization that used the matrix organizational form. Table XII shows the correlations between influence styles and the effectiveness variables. Due to the small sample size, the number of significant relationships is substantially decreased. Only friendship were significantly associated with two variables, Job Satisfaction and Willingness to disagree, and challenging work and reward were associated with Job Satisfaction.

This analysis treats all individuals as similar. A potential difference could arise in the military/civil service population surveyed.

Due to the differences in career that the military

Table XII. Correlations among Influence Method and Effectiveness Variables for those Individuals working Only with a Functional Manager.

Influence Method	Job Satisfaction	Work Involvement	Responsive-ness	Willingness to Disagree
Legitimate Right	-.08	.21	.20	.14
Expertise	.21	.16	-.06	-.13
Referent	.25	.21	-.01	-.02
Coercive	.04	.00	-.02	-.10
Reward	.41**	.22	.09	.27
Performance Rating	.08	.23	-.19	.14
Future Work	.17	.12	.00	-.04
Friendship	.35*	.18	.10	.35*
Challenging Work	.43**	.10	-.01	-.10
Responsibilities of Managers	.00	.03	.20	-.11

**p < .01 two tailed

*p < .05 two tailed

n = 38

Table XIII. Distribution and Test of Means of Responses for Civil Servants and Military Members (Effectiveness Variables and Functional Manager Influence Methods).

Variables	Civil Servants		Military	
	Mean	SD	Mean	SD
Effectiveness				
Job Satisfaction	19.81	3.02	19.55	3.79
Work Involvement	14.91	2.61	15.19	2.81
Responsiveness (PM[a])	80.56	17.40	79.88	21.33
Willingness to Disagree (PM)	7.58	2.38	7.72	2.56
Responsiveness (FM[b])	82.41	16.56	76.68	25.75
Willingness to Disagree (FM)	7.57	2.21	7.58	2.30
Influence Methods (FM)				
Legitimate Right	4.49	1.71	4.52	1.92
Expertise	5.32	1.54	5.01	1.78
Referent	5.06	1.62	5.00	1.66
Coercive	2.97	1.75	2.81	1.62
Reward	4.23	1.71	4.62	1.55
Performance Rating	5.33	1.67	5.74	1.62
Future Work	5.32	1.49	5.14	1.75
Friendship	4.59	1.53	4.38	1.79
Challenging Work	4.78	1.57	4.74	1.67
Responsibilities of Manager	4.87	1.68	4.88	1.69

a. PM = Project Manager
b. FM = Functional Manager
n = 145 Civil Servants and 80 Military

members and civil servants have, an analysis was made of these subpopulations. Table XIII and XIV show the distribution of responses for military members and civil servants. Surprisingly, in Table XIII , none of the effectiveness variables or the functional manager influence styles showed a significant difference between military and civil servants. Table XIV shows that the military members did perceive a significantly higher use of three influence styles by project managers: expert, referent and impact on Performance Rating. Since the performance rating has much more effect on the military member's career, it is likely that the member is more sensitive to the use of such influence, and perhaps project managers perceive it as more effective. It is interesting to note that most project managers were military.

A slightly different issue is the distribution of performance ratings received by the military. Question twenty-one was added to investigate this issue. As a result of the distribution of percentage of responses received by Melhart (1976: 66), it appears that the question is a good surrogate for determining the ratings received by an individual. Melhart's distribution (.23/ .28/ .49) closely approximates the forced distribution under the new OER system (.22/ .28/ .50). At the time of his survey most individuals had one performance rating under the new system. The distribution of results from this effort was not so clear cut (.15/ .26/ .59) but most individuals then had two performance ratings under the new system. While the sample is rather small (80) the differences in responses indicate that there are

Table XIV. Distribution and Test of Means of Responses for Civil Servants and Military Members (Project Manager Influence Methods).

Variables	Civil Servants		Military	
	Mean	SD	Mean	SD
Legitimate Right	3.96	1.77	4.02	1.92
Expertise	4.88	1.52	5.45**	1.34
Referent	4.92	1.43	5.42**	1.35
Coercive	2.77	1.67	2.50	1.63
Reward	3.56	1.80	3.84	1.72
Performance Rating	3.63	2.08	4.48**	2.27
Future Work	3.90	2.00	3.91	2.06
Friendship	4.12	1.66	4.41	1.73
Challenging Work	4.20	1.66	4.51	1.73
Responsibilities of Manager	4.81	1.64	4.80	1.77

**p < .01 two tailed

n = 145 Civil Servants and 80 Military

distinction between individuals receiving different ratings. Table XV gives the distribution of the effectiveness responses for positive, neutral and negative ratings. One difference is the relative rankings of responsiveness to the functional manager versus the project manager. The differences between the two for a person with a positive rating is 7.5% while for a negative rating it is -5.7%. While difficult to be sure of the cause of these differences, it appears that people with positive performance ratings are most responsive to functional managers, people with neutral ratings are about equally responsive to both types of manager and those with negative ratings are more responsive to project managers.

A regression analysis was performed to attempt to develop a relationship to predict each of the effectiveness variables, based upon use of the different influence styles. It was hoped that this would provide a better understanding of the variance in the data as a function of several influence styles at once.

Using all 20 variables, a predictive equation for Job Satisfaction had an R^2 of .24. The key variables accounting for two-thirds of this explanatory power were Challenging Work, Coercion and Referent Influence. Challenging Work and Referent Influence were positively related to Job Satisfaction and Coercion was negatively associated. There was only this much explanatory power due to correlations among the predictor variables. For example, the correlation between Referent Influence and Expertise for the functional manager was .67. Further, the correlation between Challenging Work and Expertise

Table XV. Distribution of Responses for Groups Holding Different Views of the New OER System.

Attitude	Positive[a]		Neutral[b]		Negative[c]	
	Mean	SD	Mean	SD	Mean	SD
Job Satisfaction	19.83	4.47	20.62	3.15	19.00	3.83
Work Involvement	15.50	3.06	15.14	3.23	15.13	2.60
Willingness to Disagree						
(with Project Manager)	8.25	2.14	8.33	2.18	7.32	2.77
(with Functional Manager)	8.08	2.27	8.48	1.81	7.04	2.40
Responsiveness						
(to Project Manager)	77.33	28.35	83.33	13.01	78.98	22.53
(to Functional Manager)	84.83	14.12	79.67	24.24	73.26	28.33

a. n = 12

b. n = 21

c. n = 47

for the functional manager was .46. As a result, even though Expertise of the functional manager was significantly correlated with Job Satisfaction, it added no improved explanatory power.

The regression equation developed for Work Involvement was not statistically significant. This lack of relationship between the influence methods and Work Involvement implies that Work Involvement is not an attribute of the influence methods used by managers.

Similar negative results were developed for Willingness to Disagree with the Functional Manager. A significant predictive equation for Willingness to Disagree with the Project Manager had an R^2 of .11. The key variables were influencing Future Work Assignments and Legitimate Right.

The manager can influence the Responsiveness of the individual. An R^2 of .18 was computed for Responsiveness to the Functional Manager and an R^2 of .17 for Responsiveness to the Project Manager. One variable, Referent influence, accounted for 14% of the variability within Responsiveness to the Functional Manager. On the other hand, three variables, Friendship, Coercion and Expertise, accounted for 12% of the variability within Responsiveness to the Project Manager.

IV. Summary, Conclusions and Recommendations

Summary and Conclusions

The purpose of this study was to investigate the independence and the effectiveness of influence methods used in project management. To accomplish this, 264 personnel answered a questionnaire. These individuals were assigned to six different System Program Offices at Wright-Patterson Air Force Base and their functional areas were:

Engineering
Test and Evaluation
Program Control
Configuration Management
Procurement
Integrated Logistics Support
Manufacturing

The data obtained from the questionnaires was analyzed using the methods described in Chapter II.

The questionnaires dealt with six different effectiveness variables: Job Satisfaction, Work Involvement, Responsiveness to the Functional Manager, Responsiveness to the Project Manager, Willingness to Disagree with the Functional Manager, and Willingness to Disagree with the Project Manager. It further dealt with the use of ten influence methods by the Project Manager and the Functional Manager. These influence methods as seen by the project personnel were:

1. The Legitimate Right to direct.
2. Expertise
3. Referent

4. Coercive
5. Reward
6. Influencing Performance Rating
7. Influencing Future Work Assignments
8. Personal Friendship
9. Challenging Work
10. Responsibilities as the Manager

The first five of these influence methods correspond to the five power bases hypothesized by French and Raven (1959), and the last five were used by Thamhain and Gemmill (1974) and Melhart (1976).

The primary centers of interest in the analysis were to determine a list of independent influence dimensions for Project Managers and Functional Managers based upon the French and Raven typology, to determine a list of independent influence dimensions for Project Managers and Functional Managers based upon the list of ten influence methods, to determine the relationship between the use of the independent influence dimensions with the effectiveness variables for both the Project and Functional Manager, and to determine the relationship between the use of all the influence methods with effectiveness for both the Project and Functional Manager.

Additional areas of interest were to determine the relationship between the use of an influence method and the reasons project personnel gave for complying with a manager's request, to determine the differences between individuals working for two managers, to determine differences between military respondents and civil service respondents, and to

determine the distinctions between individuals having different perceptions of the forced distribution CER System.

An analysis of the use of influence methods by Project Managers and Functional Managers shows the same dimensions. Based upon the French and Raven typology, the manager uses two independent dimensions of influence: Individual influence and Pressure influence. The first dimension, Individual influence, involves the use of rewards, expertise and referent influence. The second, Pressure influence, includes the use of legitimate right and coercion.

The analysis of all ten influence methods also showed that Project Managers and Functional Managers used the same influence dimensions. The manager has three independent influence dimensions, Personal influence, Reward influence and Pressure influence. The dimension entitled Personal influence is composed of expertise, referent influence, friendship and challenging work assignments. The second dimension, entitled Reward influence, consists of using rewards, influencing performance ratings and future work, and being friendly. The last dimension, entitled Pressure influence, involves the use of penalties and letting subordinates know of the manager's legitimate rights and responsibilities.

Two of the effectiveness variables are strongly correlated to the influence dimensions. Responsiveness is strongly associated with the use of the Personal dimension for both types of manager, and the use of the Rewards Dimension for both types of manager. Job Satisfaction is negatively

associated with the use of the Pressure dimension for both types of manager. Further, there is a positive relationship between Job Satisfaction and the use of Personal Influence by the Functional Manager.

When the effectiveness variables are compared to the specific influence methods it is clear that the influence methods used by the manager have little relationship with overall Work Involvement or overall Willingness to Disagree. These variables appear to be attributes of the individual which do not depend upon inputs such as a manager's use of an influence method. The Project Manager's influence methods have less of a relationship with Job Satisfaction than do the Functional Manager's. For both types of Manager, Job Satisfaction is positively associated with challenging work and negatively associated with coercion. There is also a positive relationship between Job Satisfaction and the Functional Manager's use of expert and referent power. Responsiveness does show a significant relationship for most of the influence methods for both types of manager. In fact, the only method which did not have a significant relationship for either type of manager was legitimate right, which might indicate that Project Managers should not be concerned about lacking a legitimate right to direct. The strongest correlations with Responsiveness were with the use of expert and referent influence. The only negative correlation was between Responsiveness and the use of Coercion. These results are in general agreement with the research noted in Chapter I. The major difference is that in this study, friendship

was significantly positively correlated with Responsiveness.

In summary, not only are the influence dimensions related to different effectiveness variables but also within a particular dimension, some methods are more closely related to the effectiveness variables than others. While influence methods have little relationship with Work Involvement and Willingness to Disagree, the manager's use of influence dimensions and methods do have a significant relationship with Job Satisfaction and Responsiveness. The manager should try to emphasize the use of the Personal Influence dimension, specifically by providing challenging work, being an expert and acting in a manner people admire and respect. He should avoid the use of the Pressure dimension and particularly avoid the use of the Pressure dimension and particularly avoid applying pressure penalties. These actions are the most strongly associated with increased Job Satisfaction and Responsiveness.

Other findings of interest indicate that Project Managers are using the influence methods which project personnel gave as reasons for complying with a manager's request while Functional Managers are not. (The reasons were those determined by Melhart in 1976. See Chapter III.) Based upon the 38 individuals who did not work closely with a Project Manager, authority ambiguity did not significantly change the level of effectiveness, or the influence methods used by Functional Managers. There was little difference between the civilians and military who responded. Finally, the people who had a positive perception of the forced distribution OER

were, on the average most responsive to their Functional Manager and those with a negative perception tended to be least responsive to their Functional Manager.

In conclusion, this thesis has dealt with the independence and effectiveness of influence methods used in Project Management. Clearly, influence methods and dimensions are not the only variables involved in the study of effectiveness. Certainly the individual's effectiveness is also modified by his personal history, his co-workers, the organizational structure, the job itself and many other variables. However, it is hoped that the results of this study will be of value in developing a coherent system of thought about influence methods and the matrix organizational environment.

Recommendations for Future Study

1. It is recommended that a similar study of influence methods be made in groups using a functional organizational form. The objective would be to determine if the independence and effectiveness of influence methods are a function of the organizational form. It would further imply the impact authority ambiguity has on effectiveness.

2. It is recommended that a study be made of the differences between the use of an influence method and the possession of an influence source. The objective would be to determine the relationship between possession of a power, the use of a power source, and effectiveness. For example, it might be hypothesized that a functional manager should have the legitimate right to direct, but if he uses that right effectiveness would be reduced.

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APPENDIX A

Questionnaire

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY (AU)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

May 77

REPLY TO ATTN OF: ENS

SUBJECT: Questionnaire on Matrix Management Styles (USAF SCN 77-96)

TO: Recipients

1. The attached questionnaire has been developed as part of my thesis effort towards an AFIT Masters degree. The thesis will study the effectiveness of management styles within a matrix organization. This effort has been approved by the SPO Director and the results of the effort will be provided to this SPO.

2. Please take the few minutes necessary to complete the questionnaire and then send it to Captain Leclaire, AFIT/ENS. The questionnaire is self-explanatory. DO NOT put your name on the questionnaire as we do not want to identify responses by individuals.

3. Captain Leclaire must have all questionnaires no later than 30 May 1977. Thank you for your prompt attention to this matter.

RICHARD C. LECLAIRE, Capt, USAF
Student, GSM-77S

PRIVACY STATEMENT

In accordance with paragraph 30, AFR 12-35, the following information is provided as required by the Privacy Act of 1974:

a. Authority

(1) 5 U.S.C. 301, Departmental Regulations: and/or

(2) 10 U.S.C. 80-12, Secretary of the Air Force, Powers and Duties, Delegation by.

b. Principal purposes. The survey is being conducted to collect information to be used in research aimed at illuminating and providing inputs to the solution of problems of interest to the Air Force and/or DOD.

c. Routine Uses. The survey data will be converted to information for use in research of management related problems. Results of the research based on the data provided, will be included in written Master's thesis and may also be included in published articles, reports, or texts. Distribution of the results of the research, based on the survey data, whether in written form or orally presented, will be unlimited.

d. Participation in this survey is entirely voluntary.

e. No adverse action of any kind may be taken against any individual who elects to participate in any or all of this survey.

QUESTIONNAIRE

1. What is your work specialty within the SPO?

____Engineering ____Procurement

____Test and Evaluation ____Integrated Logistics Support

____Program Control ____Manufacturing

____Configuration Management ____Other

2. What is your highest education level?

____High school plus ____Masters

____Bachelors ____Masters plus

____Bachelors plus ____PhD

3. How long have you been working with the project manager (individual responsible for the accomplishment of a specific objective such as defensive avionics) you work most closely with?

____Years ____Months

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

____Years ____Months

5. On most work days, how often does time seem to drag for you?

____about half the day or more

____about 1/3 of the day

____about 1/4 of the day

____about 1/8 of the day

____time never seems to drag

6. Some people are completely involved in the job--they are absorbed in it night and day. For others, their job is simply one of several interests. How involved do you feel in your job?

____very little: my other interests are more absorbing

____slightly involved

____moderately involved: my job and my other interests are equally absorbing to me

____strongly involved

____very strongly involved: my work is the most absorbing interest in my life.

7. How often do you do extra work for your job which is not really required of you?

____almost every day

____several times a week

____about once a week

____once every few weeks

____about once a month or less

8. Would you say you work harder, less hard or about the same as other people doing your type of work in the SPO?

____much harder than most others

____a little harder than most others

____about the same as most others

____a little less hard than most others

____much less hard than most others

9. Which one of the following shows <u>how much of the time</u> you feel satisfied with your job?

____all of the time

____most of the time

____a good deal of the time

____about half of the time

____occasionally

____seldom

____never

10. Choose the one of the following statements which best tells how well you like your job.

____I hate it

____I dislike it

____I don't like it

____I am indifferent to it

____I like it

____I am enthusiastic about it

____I love it

11. Which one of the following best tells how you feel about changing *your job*?

____I would quit this job at once if I could.

____I would take almost any other job in which I could earn as much as I *am earning now.*

____I would like to change both my job and my occupation.

____I would like to exchange my present job for another one.

____I am not eager to change my job, but I would od so if I could get a better job.

____I cannot think of any jobs for which I would exchange.

____I would not exchange my job for any other.

12. Which one of the following shows how *you think you* compare with other people?

____No one likes his job better than I like mine.

____I like my job *much* better than most people like theirs.

____I like my job better than most people like thiers

____I like my job about as well as most people like theirs.

____I dislike my job more than most people dislike theirs.

____I dislike my job much more than most people dislike theirs.

____No one dislikes his job more than I dislike mine.

13. Think of the project manager with whom you work most closely. Based upon the scale below, indicate your degree of agreement with each of the following ten statements. (Please use whole numbers only.)

1.....2.....3.....4.....5.....6.....7

Strongly Disagree — Neutral — Strongly Agree

____a. He lets me know he has the legitimate right to direct me.

____b. He demonstrates special knowledge or expertise.

____c. He causes me to respect and admire him as a person.

____d. He applies pressure or penalizes me in some way.

____e. He rewards me in some way.

____f. He influences my performance rating.

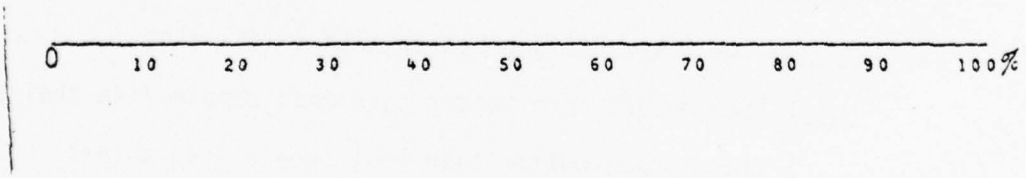
____g. He influences my future work assignment.

____h. He has established a personal friendship with me.

____i. He assigns things which are professionally challenging.

____j. He lets me know he has responsibilities as the manager

14 Based upon the following scale, indicate what percentage of the time you meet that project manager's requests with maximum effort. (Please use a vertical line where you feel it is appropriate. For example, a vertical line halfway between 50 and 60 would indicate 55%.)



15. How free do you feel to disagree with that project manager on a face-to-face basis.

____It's better not to disagree.

____I'd hesitate some before disagreeing.

____I'd hesitate only a little.

____I wouldn't hesitate at all.

16. Approximately how many times during the past year have you told that project manager about some project related decision which you did not like?

____never during the past year.

____once during the past year.

____twice during the past year.

____three times during the past year.

____about five times during the past year.

____six to ten times during the past year.

____more than ten times during the past year.

17. Think of your functional manager. Based upon the scale below, indicate your degree of agreement with each of the following ten statements. (Please use whole numbers.)

1.....2.....3.....4.....5.....6.....7

Strongly Disagree — Neutral — Strongly Agree

____a. He lets me known he has the legitimate right to direct me.

____b. He demonstrates special knowledge or expertise.

____c. He causes me to respect and admire him as a person.

____d. He applies pressure or penalizes me in some way.

____e. He rewards me in some way.

____f. He influences my performance rating.

____g. He influences my future work assignment.

____h. He has estalbished a personal friendship with me.

____i. He assigns things which are professionally challenging.

____J. He lets me know he has responsibilities as the manager.

18. Based on the following scale, indicate what percentage of the time you meet your immediate functional manager's requests with maximum efforts. (Please use a vertical line where you feel it is appropriate. For example, a vertical line halfway between 50 and 60 would indicate 55%.)

0 10 20 30 40 50 60 70 80 90 100 %

19. How free do you feel to disagree with your immediate functional manager on a face-to-face basis?

____It's better not to disagree.

____I'd hesitate some before disagreeing.

____I'd hesitate only a little.

____I wouldn't hesitate at all.

20. Approximately, how many times during the past year have you told your immediate <u>functional manager</u> about some decision which you did not like?

____never

____once during the past year

____twice during the past year

____three times during the past year

____about five times during the past year

____six to ten times during the past year

____more than ten times during the past year

21. <u>For Military Only</u>. Do you feel the new OER System has altered your perception of your job situation?

____It has had a positive effect

____It has not altered my perception

____It has had a negative effect.

22. What organization do your work for? This will not be used to identify you as an individual. If you are collocated, indicate the SPO you spend your time with.

___

___

___

___

___

___

___

THANK YOU FOR YOUR TIME IN FILLING OUT THIS QUESTIONNAIRE.

APPENDIX B

Subpopulation Means of Responses

Key to Appendix B

a. T&E - Test and Evaluation
b. PC - Program Control
c. CM - Configuration Management
d. Proc - Procurement
e. ILS - Integrated Logistics Support
f. Manf - Manufacturing
g. PM - Project Manager
h. FM - Functional Manager
i. HS - High School (plus)
j. B - Bachelors Degree
k. B+ - Bachelors Degree plus some graduate credits
l. M - Masters Degree
m. M+ - Masters Degree plus other extra credits

1. Range of Job Satisfaction 4.0 - 28.0 with higher numbers indicating higher satisfaction.
2. Range of Work Involvement 4.0 - 20.0 with higher numbers indicating higher involvement.
3. Range of Willingness to Disagree 2.0 - 11.0 with higher numbers indicating higher willingness to disagree with a manager.
4. Range of Responsiveness 1.0 - 100.0 with higher numbers indicating higher responsiveness to a manager.

* Range of all influence methods 1.0 - 7.0 with higher numbers indicating higher use.

Table B-I. Means of Effectiveness Responses by Work Specialty.
(See Key to Appendix B for explanation of superscripts.)

Variable	Engr	T&E[a]	PC[b]	CM[c]	Proc[d]	ILS[e]	Manf[f]
Job Satisfaction[1]	19.77	21.00	19.21	20.77	19.68	17.71	20.86
Work Involvement[2]	14.35	16.00	15.21	15.92	15.17	14.57	15.00
Willingness to Disagree[3]							
(with Project Manager)	7.45	9.30	7.15	8.23	8.10	8.86	7.07
(with Functional Manager)	7.11	9.50	7.56	8.30	7.76	8.00	7.64
Responsiveness[4]							
(to Project Manager)	80.73	82.20	82.69	78.54	78.39	88.57	75.36
(to Functional Manager)	79.47	88.20	77.15	83.30	85.49	88.29	74.29
Number of data points	66	10	48	26	41	7	14

Table B-II. Means of Project Manager Influence Methods by Work Specialty. (See Key)

Variable *	Engr	T&E[a]	PC[b]	CM[c]	Proc[d]	IIS[e]	Manf[f]
Legitimate Right	3.92	4.00	3.94	4.15	3.78	4.86	3.50
Expertise	4.98	5.20	5.46	4.85	4.46	6.14	5.93
Referent	5.09	5.30	5.35	4.85	4.61	5.29	5.86
Coercive	2.85	2.60	2.71	2.58	2.46	2.53	1.86
Reward	3.50	4.70	3.44	3.88	3.32	3.14	4.43
Performance Rating	4.08	4.70	4.19	3.15	3.02	4.14	5.21
Future Work	4.14	3.80	4.02	3.27	3.34	2.43	5.07
Friendship	4.02	3.90	4.60	4.54	3.78	4.71	4.50
Challenging Work	4.32	5.10	4.06	4.42	3.76	4.71	5.29
Responsibilities of Manager	5.01	4.90	4.85	4.85	4.29	5.14	4.14

Table B-III. Means of Functional Manager Influence Methods by Work Specialty (See Key).

Variable*	Engr	T&E[a]	PC[b]	CM[c]	Proc[d]	ILS[e]	Manf[f]
Legitimate Right	4.36	4.90	4.29	4.96	4.54	4.71	4.14
Expertise	5.36	5.00	4.69	5.35	5.17	5.43	6.43
Referent	5.26	5.20	4.58	4.92	4.98	5.71	5.86
Coercive	2.67	2.10	3.12	3.27	2.85	2.57	2.64
Reward	4.39	5.20	3.98	4.54	4.39	5.43	4.36
Performance Rating	5.50	5.50	5.31	5.46	5.51	6.57	5.36
Future Work	5.16	4.20	5.04	5.54	5.54	4.86	5.79
Friendship	4.51	4.00	4.31	4.69	4.59	6.28	4.14
Challenging Work	4.74	5.20	4.25	4.65	5.07	5.71	5.21
Responsibilities of Manager	4.55	5.10	4.92	5.23	5.05	5.43	4.29

Table B-IV. Means of Effectiveness Responses by Education Level. (See Key)

Variable	HS[i]	B[j]	B+[k]	M[l]	M+[m]	PhD
Job Satisfaction[1]	20.74	19.27	19.63	19.74	19.05	22.33
Work Involvement[2]	15.52	14.15	14.51	15.72	14.94	16.00
Willingness to Disagree[3]						
(with Project Manager)	6.96	7.83	7.88	7.75	7.00	7.33
(with Functional Manager)	7.44	6.85	7.88	7.69	7.78	8.33
Responsiveness[4]						
(to Project Manager)	86.19	79.41	76.06	82.51	79.33	83.33
(to Functional Manager)	87.85	82.17	78.48	77.24	83.67	83.33
Number of data points	27	41	65	72	18	3

Table B-V. Means of Project Manager Influence Methods by Educational Level. (See Key)

Variable*	HS[i]	B[j]	B+[k]	M[l]	M+[m]	PhD
Legitimate Right	3.78	3.59	3.83	4.25	4.78	3.33
Expertise	5.11	4.61	4.80	5.49	5.39	6.00
Referent	4.63	4.80	5.05	5.42	5.22	6.00
Coercive	2.22	2.95	2.77	2.69	2.50	1.00
Reward	2.85	3.49	3.63	4.12	3.33	4.67
Performance Rating	3.11	3.41	3.83	4.37	4.50	6.33
Future Work	3.56	3.73	3.77	4.14	4.11	5.33
Friendship	3.70	4.12	4.40	4.46	3.67	4.33
Challenging Work	4.04	3.80	4.32	4.69	4.16	5.00
Responsibilities of Manager	4.44	4.44	4.78	4.99	5.72	3.33

Table B-VI. Means of Functional Manager Influence Methods by Education Level. (See Key)

Variable*	HS[i]	B[j]	B+[k]	M[l]	M+[m]	PhD
Legitimate Right	4.37	4.29	4.51	4.47	5.17	4.00
Expertise	5.59	5.39	5.32	4.83	5.28	6.00
Referent	5.07	5.20	5.02	4.93	5.17	5.33
Coercive	2.81	2.76	3.05	3.00	2.78	1.00
Reward	3.74	4.29	4.35	4.72	4.28	4.67
Performance Rating	5.04	5.10	5.32	5.86	6.06	5.67
Future Work	5.63	4.95	5.38	5.18	5.39	5.00
Friendship	4.15	4.54	4.60	4.53	4.67	4.33
Challenging Work	4.63	4.70	4.86	4.65	5.17	5.00
Responsibilities of Manager	4.70	4.88	4.63	5.04	5.61	3.33

Table B-VII. Means of Effectiveness Responses by Organization
(See key to appendix for explanation of superscripts.)

Variable	Org A	B	C	D	E	F
Job Satisfaction[1]	20.52	19.22	20.57	18.70	20.39	19.75
Work Involvement[2]	15.44	14.63	15.00	15.43	14.73	15.63
Willingness to Disagree[3]						
(with Project Manager)	7.85	7.41	7.50	7.63	8.00	8.62
(with Functional Manager)	7.70	7.38	7.93	7.60	7.45	8.62
Responsiveness[4]						
(to Project Manager)	82.81	81.09	78.36	76.20	78.52	81.88
(to Functional Manager)	81.37	79.34	79.29	77.50	82.33	86.25

Table B-VIII. Means of Project Manager Influence Methods by Organization. (See key)

Variable*	Org A	B	C	D	E	F
Legitimate Right	3.95	4.00	5.07	4.07	3.52	3.38
Expertise	5.39	5.28	5.43	4.63	4.39	4.12
Referent	5.29	5.39	5.43	4.67	4.52	4.00
Coercive	2.37	2.77	3.21	3.27	2.57	2.50
Reward	4.29	3.61	4.00	3.10	2.96	3.12
Performance Rating	4.49	4.11	4.29	2.80	3.12	3.88
Future Work	4.13	4.12	4.07	3.17	3.54	3.12
Friendship	4.28	4.30	4.21	3.80	4.18	3.62
Challenging Work	4.66	4.45	5.29	3.40	4.09	3.62
Responsibilities of Manager	4.43	4.92	5.71	5.00	4.67	4.12

Table B-IX. Means of Functional Manager Influence Methods by Organization. (See key).

Variable*	Org A	B	C	D	E	F
Legitimate Right	4.39	4.30	5.62	4.53	4.58	4.62
Expertise	5.33	5.06	5.29	5.07	5.30	5.62
Referent	5.20	4.91	5.86	4.94	4.69	5.38
Coercive	2.87	2.75	2.93	3.47	2.82	2.50
Reward	4.54	4.14	5.36	3.97	4.09	5.38
Performance Rating	5.67	5.62	5.57	4.90	5.21	4.88
Future Work	5.16	5.17	5.00	5.27	5.39	4.88
Friendship	4.56	4.14	5.29	4.73	4.45	5.25
Challenging Work	4.87	4.61	5.50	4.60	4.58	5.25
Responsibilities of Manager	4.97	4.73	5.57	4.77	4.64	5.12

APPENDIX C

Factor Analysis Supporting Data

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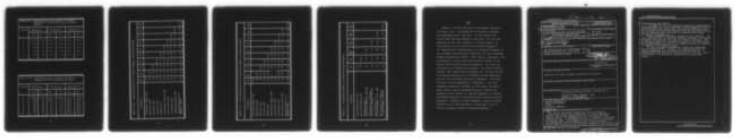

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Table C-I. Eigenvalues and Percentage of Variance explained for French and Raven Influence Methods.

Factor	Eigenvalue		% of Variance		Cumulative %	
	PM	FM	PM	FM	PM	FM
1	2.08	2.03	41.6	40.5	41.6	40.5
2	1.44	1.52	28.8	30.4	70.5	70.9
3	.64	.73	12.7	14.6	83.2	85.4
4	.56	.45	11.2	8.9	94.4	94.4
5	.28	.28	5.6	5.6	100.0	100.0

Table C-II. Eigenvalues and Percentage of Variance explained for Ten Influence Methods.

Factor	Eigenvalue		% of Variance		Cumulative %	
	PM	FM	PM	FM	PM	FM
1	4.07	3.98	40.7	39.8	40.7	39.8
2	1.73	1.79	17.3	17.9	58.0	57.8
3	1.06	.99	10.6	9.9	68.6	67.7
4	.79	.75	7.9	7.5	76.5	75.2
5	.67	.64	6.7	6.4	83.3	81.5
6	.46	.56	4.6	5.6	87.9	87.1
7	.42	.42	4.2	4.2	92.1	91.3
8	.31	.33	3.1	3.3	95.2	94.7
9	.25	.29	2.5	2.9	97.8	97.6
10	.22	.24	2.2	2.4	100.0	100.0

Table C-III. Correlation Matrix of Project Manager Influence Methods.

Variable	LR	EX	RE	CO	RD	PR	FW	FD	CW	RM
Legitimate Right (LR)	1.00									
Expertise (EX)	.15	1.00								
Referent (RE)	.08	.71	1.00							
Coercive (CO)	.38	-.10	-.14	1.00						
Reward (RD)	.27	.36	.42	.15	1.00					
Performance Rating (PR)	.35	.39	.39	.18	.64	1.00				
Future Work (FW)	.29	.36	.34	.20	.55	.74	1.00			
Friendship (FD)	-.01	.36	.43	-.05	.44	.22	.23	1.00		
Challenging Work (CW)	.21	.46	.45	.02	.61	.57	.51	.39	1.00	
Responsibilities of Manager (RM)	.56	.22	.22	.22	.22	.22	.25	.15	.38	1.00

Table C-IV. Correlation Matrix of Functional Manager Influence Methods.

Variable	LR	EX	RE	CO	RD	PR	FW	FD	CW	RM
Legitimate Right (LR)	1.00									
Expertise (EX)	.20	1.00								
Referent (RE)	.09	.67	1.00							
Coercive (CO)	.50	-.04	-.22	1.00						
Reward (RD)	.19	.30	.43	.01	1.00					
Performance Ragint (PR)	.27	.2	.28	.10	.50	1.00				
Future Work (FW)	.28	..	25	.18	.26	.53	1.00			
Friendship (FD)	.15	.40	.52	-.04	.51	.33	.29	1.00		
Challenging Work (CW)	.22	.47	.47	-.08	.55	.42	.42	.58	1.00	
Responsibilities of Manager (RM)	.62	.30	.29	.22	.35	.42	.37	.33	.45	1.00

Table C-V. Correlation Matrix of Effectiveness Variables.

Variable	JS	WI	Res. FM	WD FM	Res. PM	WD PM
Job Satisfaction (JS)	1.00					
Work Involvement (WI)	.45	1.00				
Responsiveness to Functional Manager (Res.FM)	.23	.28	1.00			
Willingness to Disagree Functional Manager (WD FM)	.10	.26	.11	1.00		
Responsiveness to Project Manager (Res. PM)	.22	.26	.54	-.03	1.00	
Willingness to Disagree Project Manager (WD PM)	.07	.14	.06	.50	-.04	1.00

Vita

Richard C. Leclaire was born in Uchitomari, Okinawa on 29 October, 1948. He attended the University of Michigan from September 1966 to June 1967. He then entered the United States Military Academy at West Point, New York and graduated in 1971 with a Bachelor of Science Degree. He then entered the Air Force and was initially assigned to L.G. Hanscom Field, Massachusetts as a Mechanical Engineer to the Aerospace Instrumentation Laboratory, Air Force Cambridge Research Laboratories (AFCRL). While there in September, 1972, he presented the paper "The Powered Balloon System" at the Seventh AFCRL Scientific Balloon Symposium. The paper was published in the Symposium proceedings. Two other technical reports, "LDF Powered Balloon Program" and "The Local Motions of a Payload Supported by a Tritethered Natural-Shape Balloon were also published during that assignment. Following this tour, he was transferred to Detachment 1, Air Force Geophysics Laboratory, Holloman Air Force Base, New Mexico. While there he was the Detachment Executive Officer and presented "Local Motions of a Payload Supported by a NCLARO Tri-Tethered Balloon" at the Eighth AFCRL Scientific Balloon Symposium. Subsequent to that assignment, Captain Leclaire entered the Air Force Institute of Technology in June of 1976 as a graduate student in Systems Management.

Unclassified (9) Master's thesis,

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
(14) 1. REPORT NUMBER AFIT/GSM/SM/77S-10 — 2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
(6) 4. TITLE (and Subtitle) THE DIMENSIONALITY AND EFFECTIVENESS OF INFLUENCE METHODS USED IN A MATRIX ORGANIZATIONAL ENVIRONMENT.	5. TYPE OF REPORT & PERIOD COVERED MS Thesis
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) (10) Richard C. Leclaire Capt USAF	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Air Force Institute of Technology (AFIT/EN) Wright-Patterson AFB, Ohio 45433	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS	(11) 12. REPORT DATE Sep [redacted] 77
	13. NUMBER OF PAGES ~~100~~ (12) 103 p.
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report) Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Approved for public release; IAW AFR 190-17

Jerral F. Guess, Captain, USAF
Director of Information

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Matrix Organization
Influence Methods
Power
Authority Ambiguity
Dimensions

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The matrix organization generate authority ambiguity whereby there is multiple supervision of project personnel. Further, the project manager has much less authority than responsibility. To compensate for this, a variety of influence methods are used. The purpose of this study is to investigate the independence and the effectiveness of the influence methods used by project and functional managers in the matrix →

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organizational environment.

To accomplish this, 264 personnel answered a questionnaire. These personnel were in six different System Program Offices at Wright-Patterson Air Force Base. The questionnaire dealt with six different effectiveness variables and ten influence methods, and the responses were subjected to a statistically based multivariate analysis.

Three independent influence dimensions were observed. The first dimension may be viewed as Personal influence, the second as Reward influence and the third as Pressure influence. Use of Personal influence is positively related to Job Satisfaction and Responsiveness, and the use of Reward influence is positively associated with Responsiveness.

The use of pressure influence is negatively associated with Job Satisfaction. Further, the influence methods most closely associated with increased Job Satisfaction and Responsiveness are providing challenging work, being an expert in the field , and acting in a manner people admire and respect.