

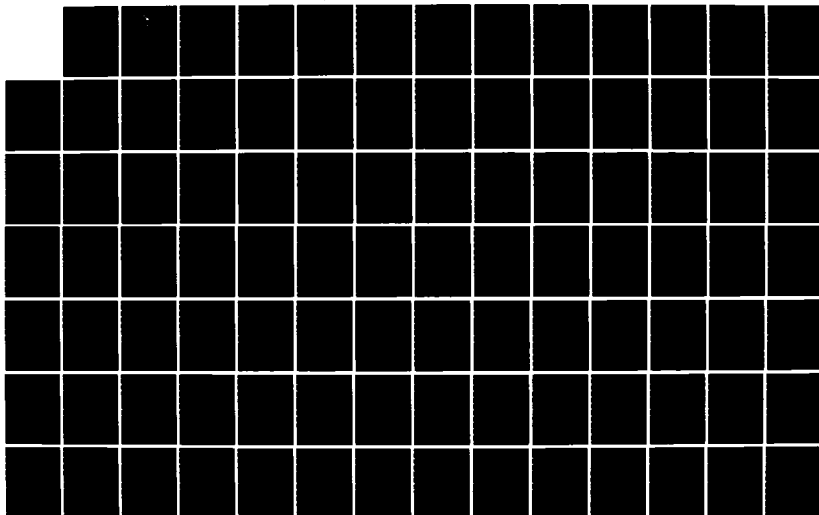
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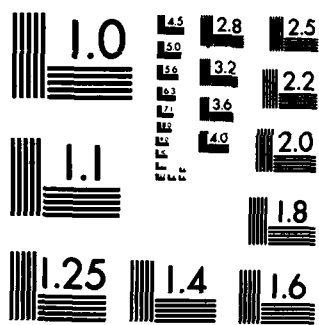
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ANALYSIS OF TRAINING NEEDS FOR CIVIL
ENGINEERING SUPERINTENDENTS AND FOREMEN

THESIS

Mark A. Correll
First Lieutenant, USAF

AFIT/GEM/LSM/84S-6

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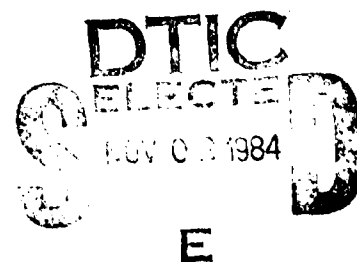
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At the request of the Air Staff, this research *Thesis* developed a comprehensive set of training needs for base civil engineering superintendents and foremen. A census survey (with a return rate of 72.3 percent) of CONUS base level civil engineering chiefs of operations was used to evaluate the need, by superintendents and foremen, of thirty candidate subject areas. A combination of parametric and non-parametric statistical techniques were used to select 17 separate subject areas in which civil engineering superintendents and foremen require training. Factor analysis was performed on these 17 subjects which resulted in a six factor functional model. The factors were: general management skills, logistics management, effective writing, managing civil engineering, personnel administration, and technical review. The model provides the basis for development of a training program for civil engineering superintendents and foremen. Differences in subject area need based upon respondent's major air command and base size are discussed. Recommendations for implementation and further study are also presented. *Originals supplied Remarks include:*
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ANALYSIS OF TRAINING NEEDS FOR CIVIL ENGINEERING
SUPERINTENDENTS AND FOREMEN

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Engineering Management

Mark A. Correll, B.S.

First Lieutenant, USAF

September 1984

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Mark A. Correll

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Abstract

At the request of the Air Staff, this research developed a comprehensive set of training needs for base civil engineering superintendents and foremen. A census survey (with a return rate of 72.3 percent) of CONUS base level civil engineering chiefs of operations was used to evaluate the need, by superintendents and foremen, of thirty candidate subject areas. A combination of parametric and non-parametric statistical techniques were used to select 17 separate subject areas in which civil engineering superintendents and foremen require training. Factor analysis was performed on these 17 subjects which resulted in a six factor functional model. The factors were: general management skills, logistics management, effective writing, managing civil engineering, personnel administration, and technical review. The model provides the basis for development of a training program for civil engineering superintendents and foremen. Differences in subject area need based upon respondent's major air command and base size are discussed. Recommendations for implementation and further study are also presented.

ANALYSIS OF TRAINING NEEDS FOR CIVIL ENGINEERING SUPERINTENDENTS AND FOREMEN

I. Introduction

Overview

Chapter 1 provides a brief look at the contents of this thesis. It starts with a short background of both the problem and the organization of concern. It then provides justification for the research as well as a list of definitions of terms which are used throughout the thesis. Further, a specific problem statement and the limitations of this research in approaching that problem are enumerated. The key underlying assumptions used in this analysis are also part of this chapter. Finally, the overall research objective and the research questions used to accomplish that objective are discussed.

Background

No self-respecting Chief Executive Officer would consider paying \$30,000 - 40,000 a year to an executive if his primary function was to edit the writing of the company's first-level supervisors, counsel their subordinates and give these supervisors specific work assignments for day-to-day operations of their functional areas. Civilian corporation heads expect their first-level

supervisors to accomplish these tasks. Civilian companies attempt to insure that their supervisors can perform managerial tasks by hiring them on the basis of supervisory experience, training , and managerial ability. In the Air Force, civilian supervisors are hired from the "qualified" personnel on or near home bases.

Unfortunately, the Air Force tends to select civilian supervisory personnel based on seniority, a good work record , or ability to get along with others rather than on supervisory ability (Chobot, 1981). As a result, the Air Force often overlooks such important qualifications as managerial and human relations abilities. Hence, many new Air Force Base Civil Engineering (BCE) Civil Engineering superintendents and foremen are not adequately prepared to assume managerial and supervisory roles. To solve this problem would require a determination of training needs for the personnel, an analysis of what training they are currently receiving, and implementation of new training to fill in the shortfall. This research attempts to perform the first of these tasks. It will determine a set of subject areas, in which, Civil Engineering (CE) superintendents and foremen need training.

Currently, there is no way to preselect and train civil service workers for supervisory positions (Chobot, 1981). All of the supervisory training that a civilian receives occurs after selection for a supervisory position

(if it occurs at all)(Chobot,1981). Further, the Air Force offers these civilians only a single course in general management principles. The course is the USAF Supervisor's Course which is designed as Professional Military Education (PME) for military enlisted members.

Availability of this course is limited. Although civilian supervisors are required to take the supervisors course within six months of assuming a supervisory position, many do not receive it until many months later (Chobot, 1981). In the author's limited experience* with Civil Engineering (CE) supervisors, many do not ever receive it.

The military counterparts to civilian supervisors receive a five part PME course during their careers. These courses are given before and after assuming supervisory positions and form a comprehensive general management training package. Senior Airmen, who are operant level workers, receive a 21.5 hours orientation course which includes instruction in leadership, management, and Non-commissioned officer (NCO) responsibilities (Forbes, 1983). There are four other courses that amplify and expand these topics as the NCO moves through his career and up the managerial chain.

*The author served 2 years as the Chief of Readiness and Logistics in a base-level CE Squadron. He was the supervisor of eight military and eight civilian personnel.

Neither Civil Engineering civilian nor military superintendents and foremen receive any formal training in management and leadership peculiarities of the Civil Engineering Squadron (CES). Any instruction they receive is in the form of On-the-Job Training (OJT) or by experience. It seems reasonable to say that instruction in Civil Engineering management would enhance instruction in general management and would lead to improved performance.

These factors come together to create first-level supervisors who are probably producing at less than optimum levels or may even be counterproductive to organizational goals. The result is the Air Force pays a Major or Lieutenant Colonel thousands of dollars a year to edit staff work, counsel operant level employees, and make day to day decisions about individual shops that a properly trained supervisor could make. A typical base CE organizational structure (Figure 1.1) shows the large scope of this problem. Since each Chief of Operations has four to six superintendent and approximately twenty-one foremen, about half military and half civilian, these functions can become all consuming.

Justification

There are two major reasons why this study is justified. First, Civil Engineers at the Air Staff level have shown interest in this topic. They were concerned enough about this problem to submit a thesis topic suggestion form to AFIT/LS for a study of this type.

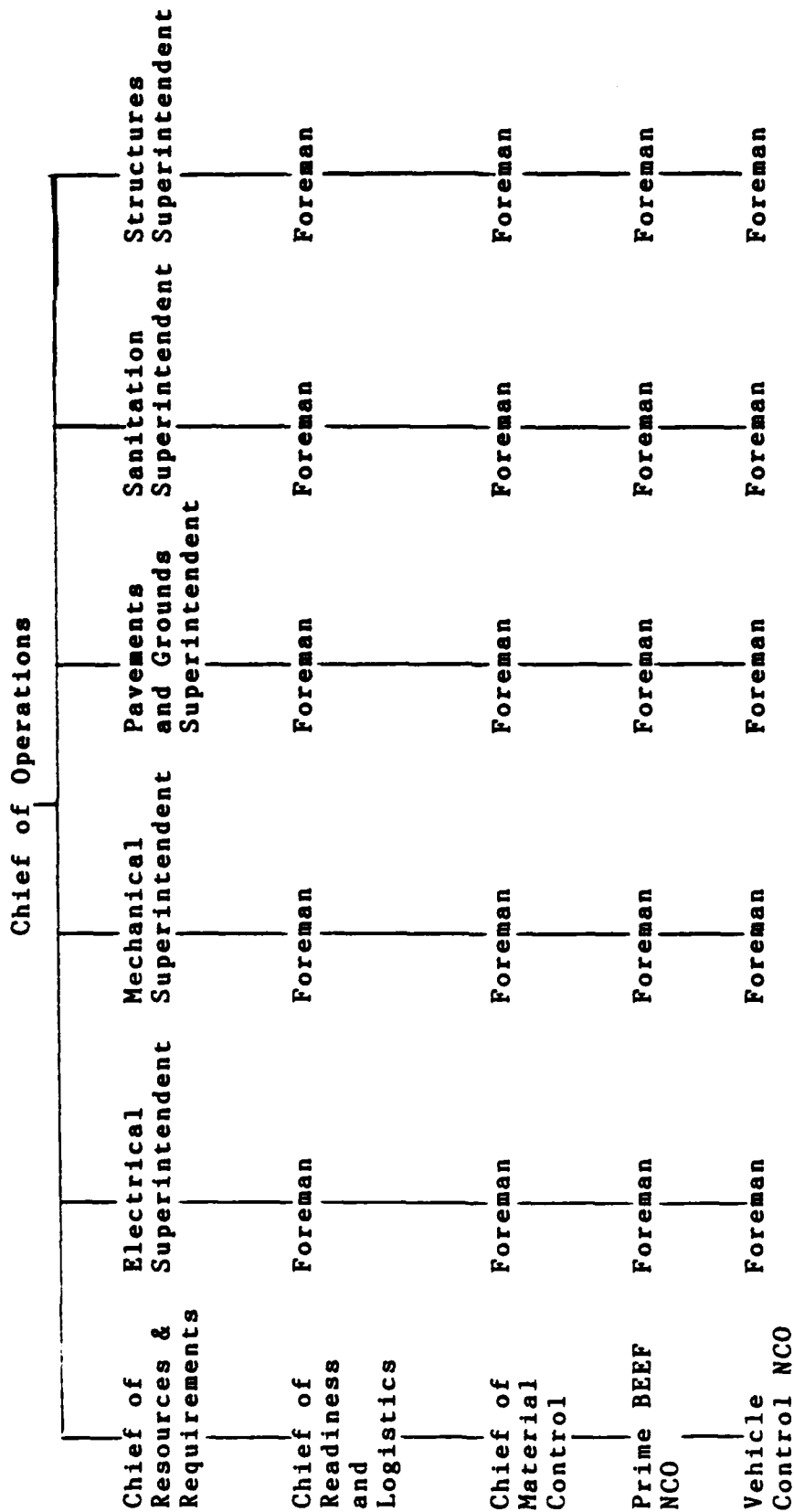


Fig 1.1. Typical Base CES Partial Structure
(adapted from AFR 85-10, 1975, p.19)

The second reason lies in the impact of these training deficiencies. Civil Engineering is solely responsible for maintaining and repairing base runways and their support facilities to insure that Air Force flying missions are accomplished. Further, CE superintendents and foremen are the front-line supervisors who insure that these runways and facilities are operating at all times. Any loss of efficiency or productivity, on their part, may directly degrade that base's ability to perform its mission by loss from use of a runway or indirectly degrade the mission by causing the loss of a support facility. The magnitude of this problem is extremely large. Figure 1.1 indicated that a typical CES has 5 superintendents and 20 foremen. Considering just CONUS Air Force installations, this represents over 2100 under-trained supervisors. Hence, considering the large number of personnel that are affected and the nature of the problem; this study can form the basis of a training program to increase productivity and efficiency among these key supervisors, and subsequently enhance readiness.

Statement of the Problem

There are two major problems which underlie the management inadequacies in Civil Engineering. First, civil service regulations and procedures create a system which denies civilian employees the opportunity to train for

supervisory positions prior to selection for these positions. Another research effort will be required to adequately resolve this topic. This thesis will focus on the second major problem which is the educational deficiencies of current supervisor training programs. In particular this thesis will address the problem that the educational needs, with respect to management functions and interpersonal skills, of Civil Engineering superintendents and foremen are not being met. As a result, an analysis of what training is needed by these personnel is valid.

Scope and Limitations

The limitations around which this work was written are as follows:

1. Only the training needs of Civil Engineering superintendents and foremen were discussed.
2. This research did not analyze current training programs provided to either civilian or military personnel.
3. The analysis subject areas was limited to a discussion of management (both general and CE unique) and human relations (also called interpersonal functions).

Assumptions

This thesis was based upon the following assumptions:

1. There are fundamentals of management which apply to all supervisors regardless of level and organization.

2. There are management tasks peculiar to Civil Engineering superintendents and foremen.

3. Civil Engineering superintendents and foremen can be considered collectively as first-level supervisors.

4. Civil Engineering is experiencing a loss of productivity due to inadequate managerial education among superintendents and foremen.

5. Based on the findings in Chapter 2, the two most significant educational needs of supervisors are in the areas of management and interpersonal skills.

Definitions

The following definitions underlie this effort and are used throughout the thesis:

1. First-level supervisor-- an employee who directly supervises operant level employees.

2. Operant-level employees-- a worker who performs only technical duties and does not perform any management or supervisory functions. In Civil Engineering these include such non-supervisory personnel as plumbers, carpenters, and electricians.

3. Foremen-- first-level CE supervisor responsible for managing one shop of operant-level employees. (i.e. carpenters, plumbers, electricians).

4. Superintendents-- first-level CE supervisor responsible for managing two or more foremen.

5. Civil Engineering supervisor or supervisors-- will be used to include both CE superintendents and foremen in one group.

Research Objective

The objective of this research was to determine a comprehensive package of training needs for CE superintendents and foremen. A two-step approach was used by the author to accomplish this research objective. First, a list of possible subject areas was created. Then a survey was administered to determine which of the subjects on that list were significantly important. It was necessary to answer several research questions in order to accomplish this objective.

Research Questions

To achieve the research objective of this thesis the following research questions were used:

1. What general managerial skills does the Civil Engineering supervisor need to accomplish his/her management functions?

2. What are the unique Civil Engineering managerial skills that are required to accomplish first-level supervisory management functions? Not all of the managerial skills required of a Civil Engineering

supervisor are applicable to all managers. Although, some are common to all supervisors; others are needed only by CE supervisors. This second group is the subject of this research question.

3. What are the specific skills that a Civil Engineering supervisor needs to accomplish his/her interpersonal functions? As will be seen in Chapter 2, there is a clear distinction between managerial skills that relate directly to productivity and those that impact productivity by impacting the human resources in an organization. The interpersonal function encompasses this indirect impact on production.

4. How does the need for these skills differ based on

- (a) base size
- (b) command?

Prior to the analysis of survey data it was impossible to determine if the need for managerial skills was constant across the Air Force. As a result, the fourth research question was used to determine if the need for managerial skills was significantly different between major commands or between different size bases.

II. Literature Review

Introduction

This chapter provides a review of the literature with respect to supervisory roles, management functions, and human relations abilities (also called interpersonal skills). It establishes and describes the widely accepted functions of managers. Further, in light of new emphasis on interpersonal skills, it reviews the importance of these skills and some of those particular skills currently considered important. Although management functions and interpersonal skills are treated separately, it is important to note that there is significant overlap between the two. Finally, since there is a virtually limitless number of sources on these topics only a few representative works will be cited.

Supervisory Roles

There are a variety of different opinions on the roles of supervisors. Most of the different breakdowns, however, condense into the two general roles of management and human relations.

Management. The Air Force defines three different supervisory roles. The first two of these fall into the category of management. The Military Training Standard/Promotion Fitness Examination pamphlet states

that managerial roles include applying the basic functions of management and using specific methods to get work accomplished (AFP 50-34,1982). Many current writers support this approach. For example, Schoen and Durand (1979) break supervisory roles into four major areas: organizational skills, decision and administrative skills, interpersonal skills, and informational skills. The first two of these can both be considered management functions. Halloran (1981) also breaks supervisory roles into four main areas. Once again two of these, supervisory skills and technical role, can clearly be considered management skills.

Human Relations. The third supervisory role that the Air Force defines is use of good human relations techniques to achieve maximum performance (AFP 50-34, 1982). There is no universally accepted definition of human relations. It can be describe however, as working with people as individuals rather than treating them as inanimate resources (Harrison, 1978). This leads to management with consideration to morale, motivation, satisfaction, recognition, and security (Harrison, 1978). Further, human relations is characterized by employee participation in managerial decisions and improving communication between superiors and subordinates (Szilagyi and Wallace, 1983). Most management writing includes a

consideration of human relations in supervisory roles. Halloran (1981) considers employee relations and dealing with special interest groups as separate roles. They both, however, fall into the general category of human relations. Schoen and Durand (1979) establish the supervisory roles of interpersonal skills and informational skills. Interpersonal skills include leadership, motivation, and understanding yourself and others (Schoen and Durand, 1979). Information skills entail understanding how communication works and face-to-face communication (Schoen and Durand, 1979). Clearly, these are both human relations oriented.

Management Functions

The Air Force definition of management is "... the efficient and economical use of our resources to reach an objective (AFP 50-34, 1982, p. 16-1)." There are several widely accepted functions of management which act as tools to accomplish this goal. The Air Force accepts the five classical functions of management that are based on the original work of Henri Fayol (AFP 50-34, 1982). Fayol (1968), who published a study in 1925, said that managerial functions were to: forecast and plan, organize, command, co-ordinate, and control to achieve organizational goals. Where forecasting is distinguished from planning in that forecasts anticipate the results of plans (Fayol, 1968). The Air Force in its PME courses,

accepts these functions with only minor changes. It teaches managers that their functions are planning, organizing, directing, co-ordinating, and controlling (AFP 50-34, 1982).

Many recent authors have eliminated the co-ordination function. They base their opinion on the thought that co-ordination is not limited to a single function but is an aspect of management which permeates all the management functions (Koontz, 1976). In its place most of these authors have substituted the managerial function of staffing. This results in a model of managerial functions which includes planning, organizing, staffing, directing, and controlling (Koontz, 1976; Halloran, 1981). A final change made recently by some authors was to rename the directing function to leading (Schoen and Durand, 1979). These authors did not, however, change the definition of this function.

There are three generally accepted levels of managers. Although each author has his own name for these levels they are all defined about equally. The lowest level managers are those who oversee the activities of operant level employees (Sallee, 1975). Mid-level managers supervise the lower level managers and top management supervises the mid-levels. Although all levels of management perform the five managerial functions, they do not perform them equally. As shown in Figure 2.1, Schoen

and Durand (1979) place emphasis on leading (directing) and controlling for the first-level supervisor. Many authors agree with this position as evidenced by Figure 2.2

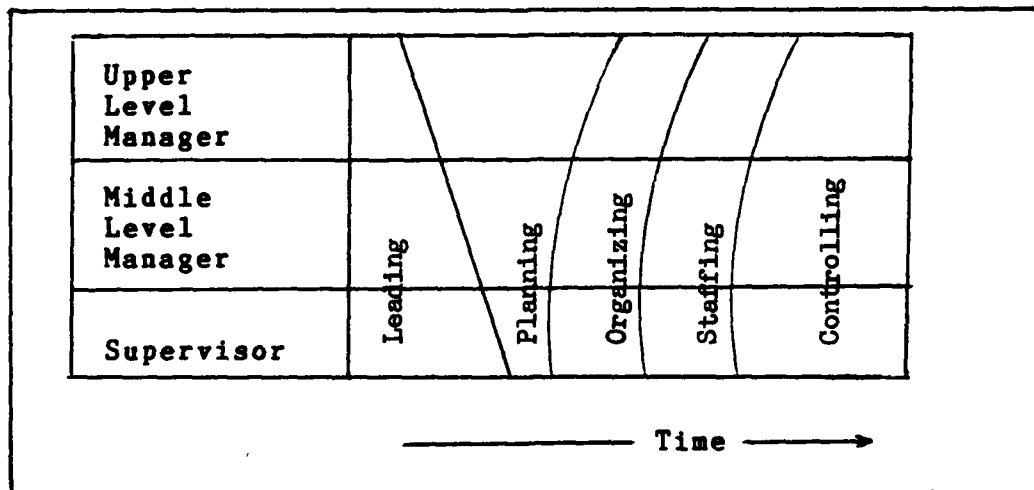


Fig 2.1. Time Devoted to Managerial Functions Related to Managerial Level(reprinted, Schoen and Durand, 1979, p. 7)

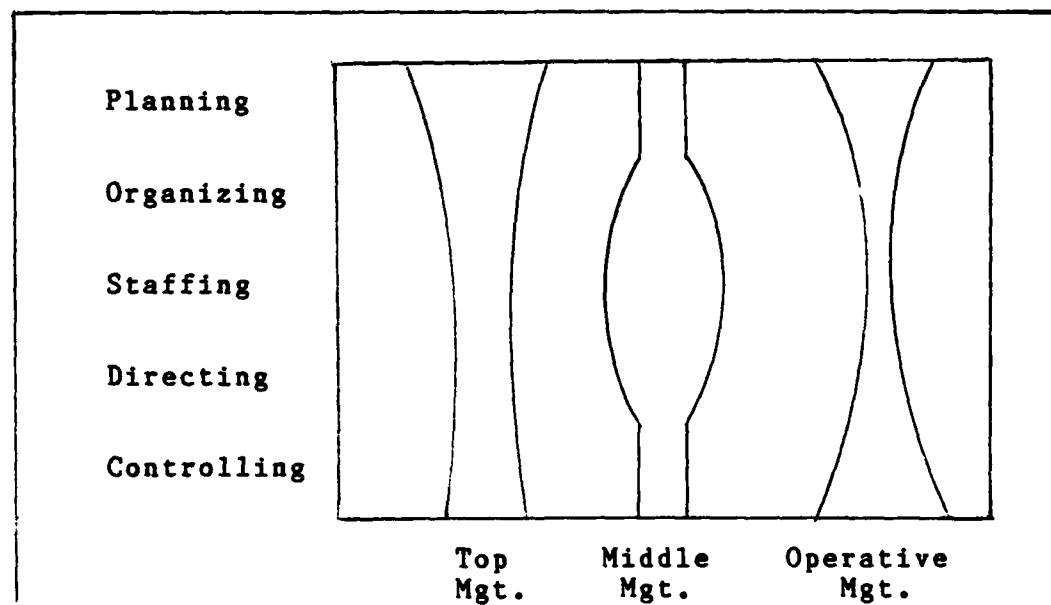


Fig 2.2. Division of Duties by Various Levels of Mgt.(reprinted, Halloran, 1981, p. 10)

which is Halloran's estimate of the division of duties for each level of management.

Managerial Functions Reviewed

Since the Air Force uses the managerial functions of planning, organizing, directing, co-ordinating, and controlling, these will be reviewed first. Also, since, a significant number of authors now use staffing as a managerial function, the literature on staffing will be reviewed as well.

Planning. Fayol (1968) defined planning in terms of a plan of action, which is a set of actions to be accomplished, including stages and specific methods, that must be used to achieve a desired result (Fayol, 1968). A more specific definition has been developed for use in the Air Force. The Air Force defines planning as analyzing the objectives, evaluating the situation in terms of time and resources, considering alternatives, selecting the best alternative and developing that and an alternative plan (AFP 50-34, 1982). Koontz (1980), not unlike the Air Force, defines planning as selecting objectives and the means to achieve them. A different view of planning incorporates the concept of opportunities. This definition says planning is anticipating the future so as to control it and hence capitalize on opportunities (Schoen and Durand, 1979). Planning is not, however, the same at all levels of management. Planning for the first level supervisor includes determining, in advance, what needs to

be done with respect to tools, equipment, space, supplies, and personnel to achieve organizational goals (Halloran, 1981). Although there are many different definitions of planning, there is a consistent theme throughout: the advanced consideration of specific objectives to maximize output.

Organizing. Fayol (1968) asserts that an organization has material and human components. Most authors, including Fayol, emphasize the human organization. There are numerous organizational duties of a manager. Some of the more important include making an effective organizational structure, staffing an organization, discipline and training (Fayol, 1968). A broad definition of organizing is arranging people, machines, materials, money and technology with maximum efficiency to achieve organizational goals (Schoen and Durand, 1979). Interestingly, although the Air Force does not identify staffing as a separate management function, it also does not include it in organization. The Air Force definition of organization emphasizes the need for good organizational structure. AFP 50-34 (1982) states that organization is a three step procedure which includes analysis of functions, making a chart of the work center organization, and assigning personnel to specific tasks. At least one author feels that organization for the first-level supervisors basically means working within existing

organizational parameters since few supervisors at this level have any control over organizational structure (Halloran, 1981). Although there are again a variety of definitions, the concept of structuring materials and personnel to facilitate organizational goals is an underlying theme throughout all definitions.

Directing. In Fayol's (1968) original work, the directing function was called command. The object of command is to maximize the inputs of employees toward the completion of the organizations' goals (Fayol, 1968). Included in this function are many leadership oriented tasks. For example, Fayol (1968) said that to accomplish this function requires knowing your workers, setting an example, good communication and employee evaluation. The Air Force uses the term directing for this function, but does not make significant changes to Fayol's definition. The Air Force teaches its students that directing is the process of assigning and guiding personnel to accomplish an objective (AFP 50-34, 1982). The two major ways to achieve direction are to command, using orders and to convince, using leadership (AFP 50-34, 1982). Direction may or may not always be necessary. Although Halloran (1981) agrees with Fayol on the tasks involved in directing, he points out that it is important for managers to know when direction is necessary and when it is not. So many of the directing tasks are really parts of leadership that some

authors have renamed this function leadership (Schoen and Durand, 1979). This evolution from command to directing to leading is not surprising considering the evolution of management theories from the mechanically oriented management science of Fayol's time to today's contingency theories which have more human relations considerations.

Controlling. Probably the simplest and least disputed management function is control. It was originally defined as determining whether or not the plan of action is being followed in order to rectify discrepancies and prevent their recurrence (Fayol, 1968). The Air Force maintains, similarly that control is the process of checking actual occurrences against the plan of action (AFP 50-34, 1982). Even recent authors agree that control consists of setting up a measurement system to insure goals are being met. (Halloran, 1981; Schoen and Durand, 1979).

Co-ordinating. As mentioned previously, most modern authors have eliminated co-ordinating as a separate function. They feel that co-ordination is necessary in all management functions. Fayol (1968) described co-ordination as harmonizing the organizations activities to insure success. In this function, he included human relations functions such as improved communication by meetings and liaison officers (Fayol, 1968). The Air Force uses a significantly more specific definition. AFP 50-34 (1982)

says that co-ordination is the process of insuring that every order relates to the objective, that orders are given correctly and that they are carried out smoothly in conjunction with other instructions. Hence, this function appears to be linked primarily to insuring organizational efficiency.

Staffing. Authors who do not include a co-ordination function do include a staffing function. This function is exclusively employee oriented. As the name implies, this function includes hiring the right personnel (Halloran, 1981). In addition, however, it includes developing the human resources to insure worker satisfaction and a productive organization (Schoen and Durand, 1979). Staffing requires several different programs. Halloran (1981) points out that the organization must recruit, appraise, train and promote personnel in addition to just hiring and paying them. Considering these tasks, it may not be unreasonable that the Air Force does not include this function in its management model. Many of these staffing functions are not within the control of Air Force supervisors. For example, recruiting is done by a separate unit. Training, except OJT, is conducted by a separate command. Even hiring may not occur within the squadron structure of the Air Force supervisor. Hence, the Air Force's use of co-ordinating instead of staffing is probably not unwarranted.

Human Relations

The purpose of this portion of the literature review is to discuss current attitudes toward the importance of interpersonal skills for managers and to outline some of the specific skills that are thought to be significant. For the purposes of this part of the review, all reference to leaders and leadership will be equated to managers and management.

The study and use of interpersonal skills is not a recent innovation in management theory. However, the level of importance attached to these skills has grown in this century. Managers, to insure their own currency, must be concerned with which theories are still considered effective and which have been discarded. Hence, it is important for managers to maintain a knowledge of expert opinion on the importance and validity of management concepts such as interpersonal skills. Assuming that the importance of this concept has been established, it is then critical for a manager to know what continuing aspects and new innovations to that concept have been developed.

This portion of the review approaches its topic by answering two fundamental questions. The first question is, "What is the current attitude toward the importance of interpersonal skills in management?" The answer to this question is to be found in the opinions of experts and the

justification behind their assertions. The second question is, "What are some of the current ideas about which particular skills are necessary?"

The Importance of Interpersonal Skills. Determining the need for these skills must be based on the opinions of experts who, on the basis of experience or education, are qualified to make opinions, and on the diversity of those opinions. This section will first present those articles supporting interpersonal development and then those arguments opposed to or limiting the use of interpersonal skills.

Supporting Literature. At least two studies have revealed the need for interpersonal skills for less experienced managers. The first study, by John Pearce, found that 87 percent of the first-time managers surveyed reported some relationship difficulties with subordinates (Advance Management Journal, 1983). Most of the problems that these managers reported were clearly interpersonal in nature. In fact, seven of eight problem situations could have been aided by use of interpersonal skills. Some of the problems were difficulty in giving instruction, problems administering discipline, and resentment of their position by subordinates (Advanced Management Journal, 1983). A second survey was conducted of graduates of the Management Institute Program in Tempe, Arizona (Inman et al., 1982). The survey was designed to determine what

aspects of the training program were most useful to managers on the job. Some of the highest ratings went to training that was interpersonal in nature. Skills such as employee communication and human relations were rated with decision making and elements of management in importance (Inman et al., 1982).

It is widely accepted that the purpose of management is to co-ordinate human and material resources to achieve organizational goals. Therefore, it is essential that the manager have the interpersonal skills necessary to co-ordinate the human aspects of the organization (Hayes, 1980). In fact several authors indicate that the ability to handle human relations is more important than even the technical knowledge of organizational production methods. Management consultant Roger Plachy says:

The leader's sensitive understanding of human nature has been described as more vital to performance than any vast accumulation of knowledge or skills concerning science, technology, statistics or abstract reasoning (Plachy, 1981, p. 59).

Further, Mr. Edward Toth (1982), Vice-President for Operations, RMI Co. states "All too often today's manager is preoccupied with achieving technological excellence at the expense of concern for the employees..." Hence both the theorists and practitioners agree that in today's managerial climate the need for human orientation is critical to the good health of the organization.

Interpersonal skills are critical at any managerial level. Many of the managerial skills required of a lower level manager lose importance as he or she moves upward in the organization. This is not so with interpersonal skills (Mandt, 1979). Mr. Edward Mandt, Vice-President of the Maccabees Mutual Life Insurance Co. defines three categories of management skills: technical and professional, interpersonal, and managerial and administrative (Mandt, 1979). Figure 2.3 shows that the technical and managerial skill requirements vary as the managerial level varies. Interpersonal skills, however, vary minutely with managerial level and make up a large portion of the skills needed at all levels of management.

The need to develop and fine-tune interpersonal skills is also based on the fact that human resource are

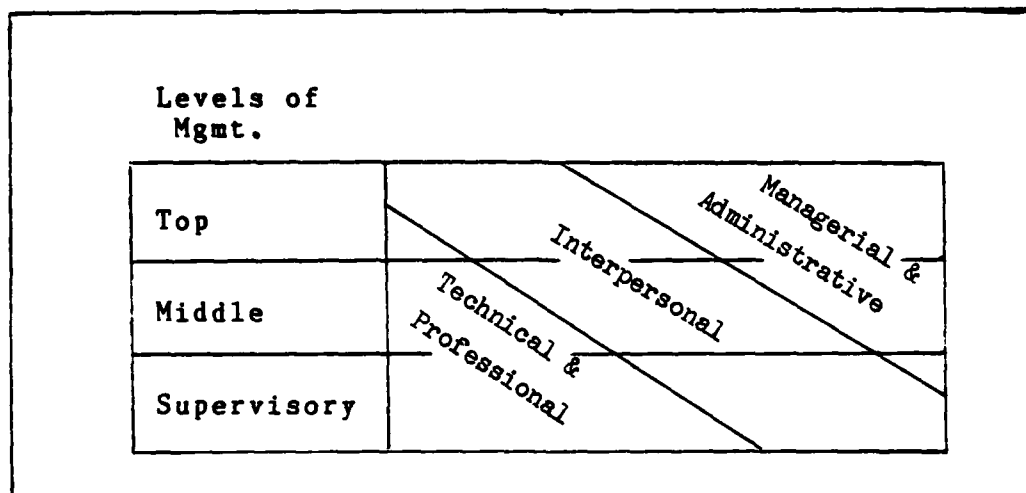


Fig 2.3. Skills Needed (reprinted, Mandt, 1979, p.396)

the only aspects of today's business that can effectively increase productivity (Student, 1978). In many cases, business has used new technology, capital investment, and human resources management to improve productivity (Student, 1978). Today, however, new technologies no longer create economies as a result of their size (Student, 1978). Further, decreasing product lives and quickly maturing or saturating markets have made new capital investments difficult to justify (Student, 1978). As a result, the only traditional resource left to develop is the human resource, a fact which implies the need for interpersonal skills.

Lost productivity as a result of poor interpersonal skills is another major factor supporting the need for these skills. For example, today's technology in office equipment for clerical workers is far superior to that used even five years ago. The advent of more useful tools would seem to dictate a corresponding rise in productivity. In fact, we have seen an average of 25 percent lost productivity in the face of these technological gains (Kinney, 1982). It is therefore necessary for managers to use their interpersonal skill to motivate workers to produce at the expected higher levels (Kinney, 1982). Hence, there is need for interpersonal skill to smooth the transition into a time of increased automation and to increase productivity.

Opposition to Interpersonal Skills. There is virtually no current literature which states that interpersonal skills are detrimental. There is some discussion, however, about the use of these skills in some areas and the extent of use.

A study by James Robinson and Robert Walker determined that autocratic (i.e. using fewer interpersonal skills) supervisors had a lower grievance rate than democratic (i.e. using more interpersonal skills) supervisors (Management Review, May 1978). This seems to be an area where the extensive use of interpersonal skills has a negative effect on the organization. The study did note, however, that there may have been factors other than managerial style which affected the grievance rate (Management Review, May 1978). Other results from this study were conflicting. They found that higher level management tended, more often, to agree with the grievance decisions of autocratic supervisors (Management Review, May 1978). However, it was also found that grievances from democratic supervisory areas were usually settled at a lower managerial level than those against autocratic supervisors (Management Review, May 1978). This was the only literature found that showed any fault with the use of interpersonal skills. Other literature, however, made mention of the extent to which interpersonal skills should be used.

Managers unanimously support the need for some level of interpersonal skills, but they also realize that there are other managerial factors which bear consideration. Most managers today are developing and using interpersonal skills on a "more is better" basis, and this is a questionable plan (Hayes, 1980). Managers must remember that interpersonal needs must be mixed with other organizational goals (Hayes, 1980). Further, the importance of interpersonal activities must not become an end in itself but only a means to the organization's goals. Organizations must be cognizant of interpersonal needs but cannot let human relations become an obstacle to achieving the purpose of the organization (Student, 1978).

Specific Interpersonal Skills. This section reviews the specific skills necessary for an effective manager as discussed by some of those authors who previously urged the continued need for interpersonal skills and by some authors not previously cited. Although there is some commonality among authors, the common points will not be discussed except in the conclusion section. This section will only list the ideas of selected authors whose opinions are representative of current literature.

Hayes. Hayes (1980) contends that there are eight skills in which a supervisor must be proficient in

order to be effective. The eight skills are:

1. self-confidence
2. ability to develop others
3. concern with impact (of his decisions)
4. use of unilateral power
5. use of social power
6. use of oral power
7. positive regard
8. ability to manage group processes (Hayes, 1980).

All of these skills are significant and necessary. They are not, however, equally important. Self-confidence, use of social power, oral communication, and the ability to manage group processes are the most significant and need the most attention (Hayes, 1980).

Austin. Managers must have the necessary skills to face each new and different situation and take action as is appropriate. Austin develops the "style-flex" model of leadership (management). In addition to the non-interpersonal behaviors of a manager, there are some leader behaviors required of him or her. The ability to enhance the motivation of employees is one of these behaviors. Further, the leader (manager) must be able to resolve their conflicts. The key to success in these areas is the leader's (manager's) ability to perceive the nuances of the situation and use the appropriate skills to meet the need. Austin does not recommend specific skills to be learned to acquire this ability. Instead, he recommends that managers become familiar with significant leadership theories such as managerial grid, path-goal,

and leader-match. By becoming more fluent in leadership theory, it is implied, the manager will be better able to handle the variety of situations which he must face. (Austin, 1981).

Student. The majority of the functions of management require the use of interpersonal skills. Student indicates that, of the four leadership (management) dimensions, three are interpersonal abilities. The four dimensions are support, interaction facilitation, goal emphasis, and work facilitation. The first three of these are interpersonal abilities. Support is the ability to create a feeling of personal value and significance in the employee. Goal emphasis is the ability to make employees want to achieve organizational goals. Interaction facilitation is the co-ordination processes between groups within the organization. These three interpersonal abilities, when combined with technical expertise (work facilitation) will result in overall effectiveness for the organization. (Student, 1978).

Others. Rather than give a comprehensive listing, some authors mention only one or two important skills, Mandt (1979) discusses the need for supervisors to be able to motivate, communicate and be sensitive to employees. In conjunction with sensitivity, it is important for managers to empathize with subordinates (Watson, 1983). Managers must not only pay attention but

also read and interpret the signals sent by employees, from the perspective of those employees (Watson, 1983).

Conclusion

This review has examined two important areas of management. The first section attempted to establish and describe commonly accepted managerial functions. The literature reveals that many of today's management authors use a five part model that includes planning, organizing, staffing, directing, and controlling. The Air Force has accepted this model except that it substitutes the function of co-ordinating for staffing. Considering the tasks included in staffing and the fact that Air Force supervisors generally do not perform these tasks, it may not be unreasonable to make this substitution. No literature was discovered that significantly deviated from these models of managerial functions. The six major managerial functions, listed above, are described by several authors and most had similar definitions to those discussed in this chapter.

The human relations portion of this review has attempted to answer two questions. The first question deals with attitudes toward the continuing need for interpersonal skills as a manager. The literature is virtually unanimous in showing that interpersonal skills are still viable and necessary in today's managerial world. The need for these skills seems imperative no matter

how long the manager has been managing and no matter at what level the manager is working. As other areas of improvement become less viable, there is a consensus that increased productivity today hinges on the use of interpersonal skills. The only point of contention is the extent to which interpersonal skills are paramount in the organization. Here, the literature indicates that although these skills are important they must be meshed with technical requirements in order to meet organizational goals.

The second goal of this portion of the review was to discuss some of the current attitudes toward what interpersonal skills are necessary. Although authors use many different terms to describe their opinions, there is some commonality between them. Authors seem to agree that motivational and communicative skills, combined with sensitivity and perceptiveness, are essential interpersonal abilities for today's managers.

III. Methodology

Introduction

In this chapter, the specific methods used to answer the research questions from Chapter 1 are discussed. The research objective was to develop a comprehensive package of training needs for Civil Engineering superintendents and foremen. To achieve this objective, the following research questions required answering:

1. What general managerial skills does the Civil Engineering supervisor need to accomplish his or her management functions?

2. What are the unique Civil Engineering managerial skills that are required to accomplish their management functions?

3. What are the specific skills that a Civil Engineering supervisor needs to accomplish his or her interpersonal functions?

4. How does the need for these skills differ based on
 (a) base size
 (b) command?

This chapter is subdivided into four sections. The first section justifies the survey questionnaire approach used. The second section discusses the population which was surveyed. The third section discusses the survey questionnaire that was used to collect the data. The last section discusses the analysis techniques used on the returned data.

Justification of Approach

This research is aimed at Civil Engineering supervisors. A search of literature written within the last eight years revealed no sources which address the management training of Civil Engineering superintendents and foremen. As a result, the author concluded that there was no readily available data to analyze.

This research assumed that there are some general management skills of CE supervisors that are generic to all first-level managers but that there are also some skills unique to these supervisors. This assumption implies the need for validation and determination. A survey of field personnel was used to validate this assumption. Further, a survey was used to determine which of those generic skills (discussed in Chapter 2) and which specific unique skills are, in fact, needed by CE supervisors.

The combination of lack of data and lack of previous research resulted in the decision to collect the required data. The questionnaire method was deemed most appropriate since the survey population was too large to allow use of personal interviews or other collection methods.

Population of Concern

The author chose to perform a census of Continental United States (CONUS), base level, Civil Engineering chiefs of operations. Chiefs of operations were chosen for

several reasons. First, since most chiefs of operations are majors or lieutenant colonels, the author expected that they would have a significant amount of managerial experience. In fact, the results shown in Chapter 4 reveal that 70 percent of the respondents had more than one year of experience as a Chief of Operations and almost 40 percent had over 3 years experience. In addition, their rank implies that most have completed management applications courses such as Squadron Officers School and, hence, have had formal education in the same managerial and human relations skills reviewed in Chapter 2. In fact only 1 of 60 respondents had not completed at least Squadron Officers School and over 85 percent had completed at least an Air Command and Staff equivalent. Finally, the chief of operations is the direct supervisor of CE superintendents and only once removed from foremen. This makes him the most knowledgeable of their daily functions, strengths, and weaknesses. Hence, the CE Chief of Operations is qualified to assess what managerial skills are of value to his superintendents and foremen. Due to the relatively small size of the population (83) a census was attempted (see Appendix B for a list of bases which received questionnaires). The census was limited to CONUS installations. This was due, first, to anticipated unacceptable delays in survey returns from overseas installations. Further this research dealt with peacetime

roles and missions, as a result there was no reason to believe that non-CONUS responses would be significantly different from CONUS responses.

Survey Instrument

A survey questionnaire (see Appendix A for a sample) was used to collect the data required to answer the research questions. The proposed questionnaire was pre-tested to insure clarity, comprehensiveness, and to provide an estimate of the time needed to complete the survey. Six of the questionnaires were given to selected faculty members of the School of Systems and Logistics and the School of Civil Engineering, AFIT, Wright-Patterson AFB, OH, as well as to the current 2750th CES, WPAFB, OH, Chief of Operations. Several changes were recommended by the pretest respondents. These were included in the survey before it was forwarded to the Personnel Survey Branch, AFMPC for approval.

The approved questionnaire was assigned USAF survey control number 84-49. The survey packages were mailed to all CONUS Chiefs of Operations on 15 May 1984.

In order to facilitate analysis of responses by base size; CONUS Air Force bases were divided into three size groups. The 83 bases shown in Appendix B were grouped by number of personnel (military and civilian not including dependents) assigned. The personnel figures were based on

the unofficial strengths as reported in the May 1983 issue of Air Force Magazine. Small bases were defined as those with less than 4000 personnel assigned and were coded "A" on the survey. Medium bases were defined as those with 4000 to 7500 personnel assigned and were coded "B" on the survey. Finally, large bases, coded "C" on the survey, were those bases with more than 7500 personnel assigned. Although surveys were coded by base size prior to mailing, this information was not used to identify individual respondents.

In order to facilitate analysis of responses with respect to command, the surveys were coded according to the following key:

- A = Strategic Air Command (SAC)
- B = Tactical Air Command (TAC)
- C = Air Training Command (ATC)
- D = Military Airlift Command (MAC)
- E = Air Force Logistics Command (AFLC)
- F = Air Force Systems Command (AFSC)
- G = Space Command (SPACECOM)

Once again, this information was not used identify individual respondents.

The survey questionnaire (Appendix A) consisted of three sections. The first section included biographical questions. The chiefs of operations were asked to provide their rank, highest level of Professional Military Education, years of experience as Chief of Operations, and years of experience in the Civil Engineering career field.

This information was used to validate previous assertions about the population and to give the reader a frame of reference.

Section 2 of the questionnaire contained general background questions dealing primarily with attitudes toward the current level of managerial training provided to superintendents and foremen as well as questions about the perceived utility of future managerial training. This section served two purposes. First, it was used to validate the assumption from Chapter 1 that CE supervisors do not receive adequate managerial training. Further, it was the author's intention to create a data base of attitudinal responses prior to the implementation of a managerial training course for CE supervisors so that future researchers will be able to make valid assessments of that course's/program's utility after implementation. A discussion of the results of this section is included in Appendix C. These results will not be discussed in the text of this thesis since they do not directly aid in answering the research questions.

Section 3 of the questionnaire was used to determine the specific needs of CE supervisors. The section was divided into three parts. Part 1 contained thirty subject areas that might be included in a training program. These subject areas were derived from two sources. Suggestions were first solicited from experienced Civil

Engineering personnel. A selection of Chiefs of Operations, superintendents, and foremen (recommended by the Air Force Engineering and Services Center) were asked to submit their suggestions. In addition, Chiefs of Operations attending the April, 1983, AFIT School of Civil Engineering, Management Operations course were asked to submit their suggestions on the form shown in Appendix D. Secondly, the literature review in Chapter 2 provided the subject areas that were generic to all supervisors.

Each survey respondent was asked to rate the need for each of the thirty subject areas on a five-point Likert scale according to the following key:

1. Virtually no need for this type of training.
2. Small need for this type of training.
3. Neutral (i.e. You understand the subject and feel that although there is some need for it, that need is not significant).
4. Significant need for this type of training.
5. Pressing need for this type of training.

Further, the respondents were asked to make this rating for civilian and military CE supervisors as separate groups.

Parts 2 and 3 of Section 3 were designed as contingencies to cover the possibility that the responses to Part 1 might be skewed toward the high end of the Likert scale and thus would be difficult to order. In Part 2 each respondent was asked to rank order the ten most important subject areas. This allowed for non-parametric analysis which was used to test the internal validity of

the survey questionnaire. A large difference between the results of the parametric and non-parametric test would indicate a low degree of internal validity. Conversely, if the results were very similar then the author could conclude that the survey had high internal validity. Part 3 was an open-ended question which allowed each respondent to submit topics which they felt were important and to weight the importance of each recommended topic. This section was used primarily as a measure of the strength of the questionnaire. A large number of suggested topics would indicate poor coverage and a weak survey while a low number of suggested topics could indicate the reverse.

A copy of the cover letter, AFIT Dean of the School of Systems and Logistics indorsement, Privacy Act Statement, and questionnaire are included in Appendix A.

Analysis

Survey responses were coded and input into AFIT's Cyber computer system. Appendix E contains a complete listing of the data files used. A descriptive presentation of the survey data is contained in Chapter 4. Suggested additional subject areas were edited for spelling and grammar and are listed in Appendix F.

Chapter 4 shows the results of the data that was returned on the questionnaires. Response rates are shown with respect to base size and major air command. The mean values for both military and civilian CE supervisors in

each of the thirty subject areas is shown. In addition, a combined mean derived from the average of the military and civilian scores is also shown. Mean values are provided in each of these categories for each subject area for

1. All respondents,
2. Respondents by base size, and
3. Respondents by command.

Analysis of variance techniques were used to determine which means were, statistically, significantly different in items 2 and 3 above. This entire analysis was performed using the Statistical Package for the Social Sciences (SPSS). The Duncan's multiple range test was used to compare grouped means to the .05 significance level (i.e. 95 percent confidence interval). Appendix G contains a more in-depth discussion of the ANOVA technique.

In Part 2 of Section 3, the respondents rank ordered the ten subject areas they believed were most important to superintendents and foremen. Point values were assigned to each subject area based on its placement in this ordering. Subjects placed in the first position received ten points, second received nine points and so forth until tenth position which received one point. The points received for each subject area were totalled and the subjects were ordered from highest to lowest points received. Total point values for each subject area are shown in Chapter 4.

The procedures used to answer the research questions are outlined in the remainder of this section.

Research Question 1. "What general managerial skills does the Civil Engineering supervisor need to accomplish his or her management functions?"

Since the first research question only deals with general management skills, only the subject areas which are germane to all first-line supervisors are valid for analysis. These subjects were chosen based on the results of the literature review in Chapter 2. The subjects from the questionnaire that apply to this research question were:

- Effective Writing (General)
- Stress Management
- General Management Principals
- Role of the First-Line Manager
- Time Management
- Problem Solving Techniques
- Planning
- Speaking Skills
- Listening.

The subjects which were found significant by the aforementioned tests form the answer to the first research question.

The survey questionnaire provided three ways to answer this question. The first way was through statistical analysis of the applicable 30 subjects in Part 1 of Section 3. The second method was through non-parametric analysis of the responses to Part 2 of Section 3 of the questionnaire (i.e., the rank ordering technique). Finally, this research question could be partially answered by the open ended question in Part 3 of Section 3. If a large number of respondents suggested the

same topic it could be considered for inclusion in the answer to the research question.

In Part 1 of Section 3 of the questionnaire the subject areas were listed in a random order. The respondents estimated the importance of each subject area on a five-point Likert scale. A parametric one-tailed t-test was used to analyze their responses. The t-test was appropriate since the sample was random, the distribution could be considered normal and interval level data (see Appendix H) was used (Meek and Turner, 1983). A one-sided test was used since the author was interested in those subjects that were thought significantly above the mean and was not interested in those significantly below the mean. The hypothesis tested for each subject area was as follows:

$H_0(\text{the null hypothesis}) : \mu < 3.50$

$H_a(\text{the alternate hypothesis}) : \mu \geq 3.50$

at a significance level of .05. The mean of 3.50 was used since the questionnaire specifically stated that a response of "4" for a subject area indicated that the respondent considered that subject significantly necessary and since values greater than 3.50 are generally rounded to 4.00. Rejection of the null hypothesis for any subject area would indicate that it was important and should be included in any future training. A failure to reject cannot lead to any statistical conclusions (Meek and

Turner, 1983). For the purpose of this research , however, a failure to reject was taken to mean that the area may be important but should not be included in training.

In Part 2 of Section 3, respondents were asked to list the ten most important subject areas in rank order. The non-parametric ordering technique described earlier was then used to determine which subject areas were most important. This second method was used because it allowed the author to go a step beyond discovering which subjects were important and determine which were most important. Further, comparing the rank order results to the t-test results could be used to test the internal validity of the survey. If the subjects that were found significant by the t-test were also high in the rank order process then high internal validity could be concluded. Conversely, if there was a large disparity between the two techniques, a low internal validity could be concluded.

Part 3 of Section 3 of the questionnaire requested suggestions for additional subject areas. In addition, the respondents were asked where in the top ten their suggestion would fall if in fact it was important enough to include in the top ten. Since analysis of these type responses is not possible they are listed with their respective weights, where given, in Appendix F for the reader's judgement.

Research Question 2. "What are the unique Civil Engineering managerial skills that are required to accomplish first-level supervisory management functions."

The subjects from the questionnaire that apply to this research question were:

- Effective Writing (AF)
- Civil Service Relations
- Civil Engineering Management
- Job Co-ordination
- Technical Instruction
- Manpower Authorization System
- Superintendents Overview
- Labor Relations
- Political Pressures
- Financial Management
- Overview of CE Mission
- Promotion Systems
- Supply Support Systems
- Vehicles.

The subjects that were found statistically significant formed the answer to the second research question.

The same methods and techniques discussed for research question 1 were used to identify which of the applicable subject areas were significant. The subject areas which applied to this research question were determined using a three step procedure. First, selected Chiefs of Operations, superintendents, and foremen were asked to submit their suggestions. Second, a Operations Management class held at the AFIT School of Civil Engineering, which consisted of Civil Engineering Chiefs of Operations, was informally polled using the form in

Appendix D. Finally, the responses were separated to avoid redundancy and all suggestions were included in the final survey.

Research Question 3. "What are the specific skills that a Civil Engineering supervisor needs to accomplish his or her interpersonal functions?"

The applicable subjects for this research question were:

- Motivation
- Leadership Topics
- Managing Conflict
- Discipline
- Professional Counseling
- Personal Counseling
- Interaction.

Again, the subjects from this list that were found statistically significant formed the answer to this research question.

The same methods and techniques used for questions 1 and 2 were used to identify statistically significant specific skills. The applicable subjects were identified based on a combination of the second half of the literature review (Chapter 2) and the responses mentioned in question 2.

Research Question 4. "How does the need for these skills differ based on

- (a) base size,
- (b) command?"

To answer this research question the author used the ANOVA procedure discussed previously and in Appendix G to determine which means were significantly different within

each of the above groups. Those which were statistically different formed the answer to this question.

For all the research questions discussed the results of the applicable procedures are given in Chapter 4 and discussed in Chapter 5.

IV. Results

Introduction

This chapter presents the results of the SPSS subroutines which were used to analyze data from the survey. The specific subroutines used to achieve these results were: CONDESCRIPTIVE, FREQUENCIES, T-TEST, ONEWAY, and FACTOR. The results shown in this chapter do not reflect responses to Section 2 of the survey. Section 2 contained background questions which served to validate assumptions made in Chapter 1 and to create a database for future research. Hence, this section does not directly relate to any of the research questions. Therefore, the results of section 2 are discussed in Appendix C.

Presentation of Data

The results of the survey are presented in the order they appeared on the questionnaire. They are: return rate, demographic data, subject area need, and rank ordering. Separate responses for civilian and military superintendents and foremen are presented only with respect to the significance of the subject areas to the respective groups. All other analysis was done with respect to an aggregate of the two groups. The aggregate responses were formed by taking a simple mean between responses for civilian CE supervisors and responses for

military CE supervisors. For example, the aggregate value for the subject area "Writing" was formed by adding the respondents answer for civilians to that for military, in the same subject, and dividing by two.

Return Rate

Of the 83 questionnaires were sent to CONUS Air Force installations. A total of 66 were returned. Six of the returned questionnaires, however, had been completed by civilians. Since this questionnaire was not approved for administration to DOD civilians those six responses were not used. As a result, the overall return rate based on 60 returns was 72.3 percent. A breakdown of survey return rates by base size and command is shown in Tables 4.1 and 4.2.

TABLE 4.1
Return Rate of Survey Respondents
by Base Size

Base Size	Number Distributed	Number Returned	Percent
Small	16	8	50.0
Medium	40	31	77.5
Large	<u>27</u>	<u>21</u>	<u>77.8</u>
Total	83	60	72.3

TABLE 4.2

Return Rate of Survey Respondents by Command

Command	Number Distributed	Number Returned	Percent
SAC	24	17	70.8
TAC	20	14	70.0
ATC	15	10	66.7
MAC	13	10	76.9
AFLC	5	4	80.0
AFSC	5	4	80.0
SPACECOM	<u>1</u>	<u>1</u>	<u>100.0</u>
Total	83	60	72.3

Demographic Data

The survey asked each respondent for four pieces of demographic information(i.e., rank, highest level of PME, amount of experience as a Chief of Operations, and amount of experience in Civil Engineering). This section presents that demographic data to provide the reader a frame of reference with respect to the survey population. Table 4.3 shows the ranks of the 60 respondents.

Table 4.4 shows the highest level of Professional Military Education (PME) completed by the respondents.

Responses included completion of courses by any method (i.e. correspondence, seminar, residence).

TABLE 4.3
Survey Respondents by Rank

Rank	Number	Percent
Lieutenant	0	0.0
Captain	17	28.3
Major	28	46.7
Lieutenant Colonel	15	25.0

TABLE 4.4
Survey Respondents by Level of PME

Highest Level Completed	Number	Percent
None Completed	1	1.7
Squadron Officers School	7	11.7
Air Command and Staff College	42	70.0
Air War College	10	16.7

In addition, a positive response was given for schools equivalent to those listed (i.e. ICAF for AWC). Table 4.5 describes the length of time that each respondent had served as a Civil Engineering Chief of Operations

TABLE 4.5

**Survey Respondents by Experience as a Civil Engineering
Chief of Operations**

Time as a CE Chief of Ops	Number	Percent
Less than 6 months	4	6.7
6 months to 1 year	18	30.0
1 to 2 years	14	23.3
2 to 3 years	1	1.7
more than 3 years	23	38.3

throughout their Air Force Career. Finally, Table 4.6 describes how long each of the respondents had been assigned in the Civil Engineering career field.

TABLE 4.6

**Survey Respondents by Length of Time
in the Civil Engineering Career Field**

Time in Civil Engineering	Number	Percent
0 to 2 years	4	6.7
2 to 4 years	5	8.3
4 to 8 years	11	18.3
8 to 12 years	17	28.3
more than 12 years	23	38.3

Subject Areas

Tables 4.7 through 4.9 show the results of analysis of the data pertaining to the different subject areas in Section 3 of the survey. Mean values are given with respect to level of need for the groups shown (1=no need, 2=small need, 3=neutral, 4=significant need, 5=pressing need).

Table 4.7 shows the mean levels of need, for the given subject areas, for Civil Engineering civilian and military superintendents and foremen. In addition the combined mean which is used in later analysis is also provided. Calculation of the combined (aggregate mean) was discussed earlier. Table 4.8 shows the combined mean level of need for each subject area broken down by base size. Table 4.9 shows the same combined means broken down by command. Note that there was only one respondent from Space Command. As a result, the values given are direct responses and not mean values. Further, since Space Command's values are not means they could not be included in an analysis of difference based on command.

Most Important Subject Areas

Each survey respondent was asked to list the top ten subject areas in rank order of importance from one to ten. Using the point assignment method discussed in Chapter 3 a total point score was determined for each subject area.

TABLE 4.7

Mean Levels of Subject Area Need for
Civil Engineering Superintendents and Foremen

Subject Number	Subject Area	For Civilians	For Military	Combined	Comments*
1	Effective Writing (General)	4.300	4.233	4.267	a
2	Effective Writing (Air Force)	4.533	4.400	4.467	a,c
3	Stress Management	3.517	3.550	3.533	
4	Motivation	3.967	3.867	3.917	a
5	General Management Principles	3.767	3.717	3.742	a
6	Role of the First-Line Manager	3.917	3.800	3.858	a
7	Time Management	3.783	3.850	3.817	a
8	Leadership	3.667	3.600	3.633	
9	Civil Service Relations	3.667	4.217	3.942	a,b
10	Civil Engineering Management	4.083	4.000	4.042	a
11	Problem Solving Techniques	3.600	3.550	3.575	
12	Job Co-ordination	3.850	3.850	3.850	a

* a. combined mean significant at the .05 level
 b. significantly higher mean for military than civilian
 c. significantly higher mean for civilian than military

TABLE 4.7--Continued

Subject Number	Subject Area	For Civilians	For Military	Combined	Comments*
13	Managing Conflict	4.000	3.950	3.975	a
14	Technical Update	3.767	3.733	3.750	a
15	Discipline	3.817	3.667	3.742	a,c
16	Professional Counseling	3.633	3.583	3.608	
17	Personal Counseling	3.567	3.550	3.558	
18	Manpower Authorization System	4.100	4.150	4.125	a
19	Superintendents Overview	3.900	3.983	3.942	a
20	Planning	3.150	3.167	3.158	
21	Labor Relations	3.500	3.900	3.700	b
22	Interaction	3.633	3.567	3.600	
23	Political Pressures	3.433	3.300	3.367	
24	Financial Management	3.717	3.700	3.708	

* a. combined mean significant at the .05 level
 b. significantly higher mean for military than civilian
 c. significantly higher mean for civilian than military

TABLE 4.7--Continued

Subject Number	Subject Area	For Civilians	For Military	Combined	Comments*
25	Speaking Skills	3.183	3.183	3.183	
26	Listening	3.667	3.650	3.658	
27	Overview of CE Mission	3.400	3.067	3.233	c
28	Promotion Systems	3.633	3.600	3.617	
29	Supply Systems	4.133	4.133	4.133	a
30	Vehicles	3.800	3.817	3.808	a

* a. combined mean significant at the .05 level
 b. significantly higher mean for military than civilian
 c. significantly higher mean for civilian than military

TABLE 4.8

Mean Levels of Subject Area Need by Base Size

Subject* Number	Small	Medium	Large	Comments**
1	4.500	4.242	4.214	
2	4.250	4.532	4.452	
3	3.625	3.565	3.452	
4	3.750	3.936	3.952	
5	4.063	3.710	3.667	
6	3.938	3.839	3.857	
7	3.688	3.726	4.000	
8	3.750	3.619	3.613	
9	4.250	3.823	4.000	
10	4.250	4.065	3.929	
11	3.500	3.600	3.571	
12	4.250	3.790	3.786	
13	4.188	3.758	4.214	
14	4.188	4.016	3.191	a
15	4.000	3.548	3.929	
16	3.438	3.629	3.643	
17	3.750	3.516	3.548	
18	4.125	4.097	4.167	
19	3.938	4.065	3.762	

* Subject numbers refer to subjects listed in Table 4.7

** a: statistically significant difference between both small and medium bases from large bases.

TABLE 4.8--Continued

Subject* Number	Small	Medium	Large	Comments**
20	3.375	3.242	2.952	
21	3.813	3.484	3.976	
22	4.250	3.371	3.691	b
23	3.375	3.371	3.357	
24	4.125	3.581	3.738	
25	3.250	3.129	3.238	
26	3.750	3.484	3.881	
27	3.438	3.258	3.119	
28	4.125	3.581	3.476	c
29	4.875	4.032	4.000	d
30	4.375	3.726	3.714	

* Subject numbers refer to subjects listed in Table 4.7

** b: statistically significant difference between small and medium bases.

c: statistically significant difference between small and large bases.

d: statistically significant difference between small bases and both medium and large bases.

TABLE 4.9

Mean Level of Subject Area Need by Command

Subject* Number	SAC	TAC	ATC	MAC	AFLC	AFSC	SPACECOM	Comments**
1	4.118	4.179	4.150	4.450	5.000	4.375	4.000	
2	4.500	4.321	4.300	4.700	5.000	4.250	4.000	
3	3.618	3.643	3.800	3.200	3.125	3.500	3.000	
4	3.941	3.893	4.000	3.650	4.500	3.750	4.000	
5	3.765	3.929	3.650	3.550	3.875	3.750	3.000	
6	4.118	3.857	3.750	3.700	4.000	3.500	3.000	
7	3.618	3.679	4.300	3.750	4.000	3.875	4.000	
8	3.853	3.464	3.650	3.150	4.250	4.000	3.000	c
9	3.971	3.964	3.750	4.000	3.875	4.375	3.000	
10	4.147	4.071	3.850	4.100	4.125	3.750	4.000	
11	3.588	3.571	3.400	3.700	4.000	3.375	3.000	

* Subject number refers to subjects listed in Table 4.7

** c: statistically significant difference between MAC and AFLC.

TABLE 4.9--Continued

Subject* Number	SAC	TAC	ATC	MAC	AFLC	AFSC	SPACECOM	Comments**
12	3.853	3.893	3.900	3.400	4.500	4.000	4.000	
13	3.882	3.643	4.000	4.300	4.250	4.375	4.000	
14	4.235	3.500	3.800	3.450	3.125	3.750	4.000	
15	3.647	3.393	3.750	4.050	4.500	3.750	4.000	
16	3.588	3.536	3.800	3.500	3.750	3.750	3.000	
17	3.618	3.393	3.700	3.550	3.250	4.000	3.000	
18	4.088	4.107	4.000	4.200	4.250	4.375	4.000	
19	4.206	3.750	3.650	4.050	4.125	4.000	3.000	
20	3.794	2.786	2.600	3.200	3.000	3.250	3.000	a, b
21	3.647	3.464	3.650	3.950	3.750	4.375	3.000	
22	3.559	3.536	3.800	3.600	3.500	3.750	3.000	

* Subject number refers to subjects listed in Table 4.7

** a: statistically significant difference between SAC and TAC

b: statistically significant difference between SAC and ATC

TABLE 4.9--Continued

Subject* Number	SAC	TAC	ATC	MAC	AFLC	AFSC	SPACECOM	Comments**
23	3.441	3.143	3.400	3.450	3.500	3.500	3.000	
24	4.029	3.286	3.200	3.900	4.250	4.250	3.000	
25	3.118	3.00	3.100	3.100	3.875	3.875	3.000	
26	3.294	3.821	3.700	3.400	4.750	4.250	3.000	c,d
27	3.206	3.321	2.900	3.250	3.500	3.625	3.000	
28	3.529	3.679	3.300	3.650	4.000	4.000	4.000	
29	4.294	4.071	3.700	4.100	4.750	4.250	4.000	
30	3.941	3.821	3.400	3.900	4.000	3.750	4.000	

* Subject number refers to subjects listed in Table 4.7

** c: statistically significant difference between SAC and AFLC

d: statistically significant difference between SAC and AFSC

Each time a subject was ranked most important it was awarded ten points. Each time it was second it received nine points. This continued in one point increments to the tenth most important which received one point. Total points for each of the thirty subject areas are shown in Table 4.10. Since 16 subject areas were found to be significant by the t-test, the 16 subjects with the highest point values were defined as most important. These were used for comparison in the discussion in Chapter 5. The top 16 subject areas from this procedure are shown in Table 4-11.

TABLE 4.10

Point Values For Subject Areas

Subject Number	Subject Area	Total Points
1	Effective Writing (General)	243
2	Effective Writing (Air Force)	291
3	Stress Management	89
4	Motivation	127
5	General Management Principles	97
6	Role of the First-Line Manager	126
7	Time Management	156
8	Leadership	76
9	Civil Service Relations	76
10	Civil Engineering Management	171
11	Problem Solving Techniques	53
12	Job Co-ordination	99
13	Managing Conflict	123
14	Technical Update	97
15	Discipline	91
16	Professional Counseling	37
17	Personal Counseling	49
18	Manpower Authorization System	151
19	Superintendents Overview	136
20	Planning	28
21	Labor Relations	66

TABLE 4.10--Continued

Subject Number	Subject Area	Total Points
22	Interaction	59
23	Political Pressures	78
24	Financial Management	73
25	Speaking Skills	49
26	Listening	105
27	Overview of CE Mission	68
28	Promotion Systems	28
29	Supply Systems	178
30	Vehicles	78

TABLE 4.11

Most Important Subject Areas by Rank Ordering

Subject Number	Subject Area	Total Points
2	Effective Writing (Air Force)	291
1	Effective Writing (General)	243
29	Supply Systems	178
10	Civil Engineering Management	171
7	Time Management	156
18	Manpower Authorization System	151
19	Superintendents Overview	136
4	Motivation	127
6	Role of the First-Line Manager	126
13	Managing Conflict	123
26	Listening	105
12	Job Co-ordination	99
5	General Management Principles	97
14	Technical Update	97
15	Discipline	91
3	Stress Management	89

V. Analysis and Discussion

Introduction

This chapter contains the analysis of the data presented in Chapter 4. Each research question is addressed separately.

The analysis outlined in Chapter 3 was used to select the subject areas that were important enough to be included in a future training course for Civil Engineering superintendents and foremen. Although not an initial part of the research, the author performed a factor analysis to see if the important subject areas could be conveniently packaged into a few, general categories. The results of the factor analysis are also included in this Chapter. Table 5.1 shows the combined means for each subject area in descending order. It will be referenced in the discussion of each of the first three research questions.

Research Question 1

"What general managerial skills does the Civil Engineering supervisor need to accomplish his or her management functions."

The survey provided three methods by which this research question could be answered. The first and strongest of these was the parametric analysis performed on the combined means of the subject areas which applied to "general management skills." Those skills by subject

TABLE 5.1

Descending Mean Levels of Need For All Subject Areas

Subject Number	Subject Area	Mean Level Of Need
2	Effective Writing (Air Force)	4.467
1	Effective Writing (General)	4.267
29	Supply Systems	4.133
18	Manpower Authorization System	4.125
10	Civil Engineering Management	4.042
13	Managing Conflict	3.975
9	Civil Service Relations	3.942
19	Superintendents Overview	3.942
4	Motivation	3.917
6	Role of the First-Line Manager	3.858
12	Job Co-ordination	3.850
7	Time Management	3.817
30	Vehicles	3.808
14	Technical Update	3.750
5	General Management Principles	3.742
15	Discipline	3.742
24	Financial Management	3.708
21	Labor Relations	3.700
26	Listening	3.658
8	Leadership	3.633
28	Promotion Systems	3.617
16	Professional Counseling	3.608

TABLE 5.1--Continued

Subject Number	Subject Area	Mean Level Of Need
22	Interaction	3.600
11	Problem Solving Techniques	3.575
17	Personal Counseling	3.558
3	Stress Management	3.533
23	Political Pressures	3.367
27	Overview of CE Mission	3.233
25	Speaking Skills	3.183
20	Planning	3.158

number from Table 5.1 were 1,3,5,6,7,11,20,25, and 26. The t-test determined that four of these nine means were significantly greater than 3.5 and hence should be included in future training. These four were:

- # 1 - Effective Writing (General)
- # 5 - General Management Principles
- # 6 - Role of the First-Line Manager
- # 7 - Time Management.

The second method of analyzing this research question was with the non-parametric rank ordering technique. Table 4.11 in Chapter 4 shows the sixteen subject areas that received enough total points to be considered significant. Six of the nine subjects were found significant by this method. In addition to the four that were identified by

the t-test, this procedure also included the subjects of Listening(#26) and Stress Management(#3).

The last avenue the survey provided was the open ended question. If a subject was suggested by several different respondents then it could be considered as part of the answer to the research question. However, there was no method of analysis available for topics which were suggested by only one or two respondents. The suggested subject areas are, however, listed by applicable research question in Appendix F.

The subject area of "Listening" was found significant by the non-parametric procedure but not by the t-test. However, 37 of the 60 respondents answered either 4 or 5 (significant need or pressing need) to this subject area. Further, its combined mean of 3.658 came close to the 3.700 needed to be significant by the t-test at .05 and would be significant at alpha equal .10. As a result, it was included as a significant subject area. Conversely, the subject of "Stress Management" had a mean of 3.533 and hence did not approach rejecting the null hypothesis of the t-test. In addition, it had the lowest total point score of all subjects found significant by rank ordering. Hence, it was not included in the final answer to the first research question.

No topics were suggested by respondents that applied to this research questions.

Based on this analysis the subjects which should be taught to aid Civil Engineering superintendents and foremen in the area of general management skills were determined. Table 5.2 shows the subjects which were found significant and identifies the general management skills that answer research question number 1.

TABLE 5.2

Significant Subject Areas: General Management Skills

Subject Number	Subject Area
1	Effective Writing (General)
5	General Management Principles
6	Role of the First-Line Manager
7	Time Management
26	Listening

Research Question 2

"What are the unique Civil Engineering managerial skills that are required to accomplish first-level supervisory management functions?"

The same three methods were used to analyze the survey data for this research question as the first. In this case, however, the analysis was performed with respect to subject areas which apply to "unique Civil Engineering management skills." Those skills, by subject number from Table 5.1, were: 2,9,10,12,14,18,19,21,23, 24,27,28,29, and 30.

The t-test found that, at the .05 significance level, 9 of these 14 subject areas should be included in future training. The nine were:

- # 1 - Effective Writing (Air Force)
- # 9 - Civil Service Relations
- # 10 - Civil Engineering Management
- # 12 - Job Co-ordination
- # 14 - Technical Update
- # 19 - Superintendents Overview
- # 18 - Manpower Authorization System
- # 29 - Supply Systems
- # 30 - Vehicles.

The rank ordering technique gave results similar to the t-test. Seven of the subjects were found to be significant and all seven were also found significant by the t-test. The non-parametric technique did not, however, include the subjects of "Civil Service Relations" and "Vehicles" in its list of important subject areas.

Three topics which apply to this research question were suggested by respondents. However, only one was mentioned more than once. That topic was "Equipment Acquisition." Further, both respondents placed this subject area in the "top ten" by rank order. Hence, future researchers may want to consider a further investigation of this topic. Since only two of the sixty respondents

suggested this topic, the author chose not to include it in answering this research question.

The analysis discussed above formed the basis for deciding which CE unique skills should be taught to CE supervisors. Table 5.3 shows the subjects which were found significant. Clearly, the seven subjects on which the parametric and non-parametric tests agree should be included. Both of the other two subjects (Civil Service Relations and Vehicles), however, were also included in the answer to the second research question. There are two reasons for this. First, the parametric test is much stronger and hence is more reliable. Second, although these two subjects did not make the "top 16" in the rank order, they do fall within the top 20.

Research Question 3

"What are the specific skills that a Civil Engineering supervisor needs to accomplish his or her interpersonal functions?"

Similarly to research questions 1 and 2, three techniques were used to analyze the data pertaining to this research question. The analysis for this research question was performed with respect to subject areas which apply to a manager's "interpersonal functions." The interpersonal skills, by subject number, were 4, 8, 13, 15, 16, 17, and 22.

Both the parametric t-test and the non-parametric rank ordering technique found the same three subject areas

TABLE 5.3

Significant Subject Areas:
Unique Civil Engineering Skills

Subject Number	Subject Area
2	Effective Writing (Air Force)
9	Civil Service Relations
10	Civil Engineering Management
12	Job Co-ordination
14	Technical Update
18	Manpower Authorization System
19	Superintendents Overview
29	Supply Systems
30	Vehicles

significant. The three significant interpersonal subjects were:

- # 4 - Motivation
- # 13 - Managing Conflict
- # 15 - Discipline.

Two subject areas which apply to this research question were submitted by respondents through the open-ended question. These two are described in Appendix F. Since each was only suggested once, the author chose not to include either in answering this research question.

Since there was no disagreement between the t-test and the rank ordering analysis, all three of the subjects were included in the answer to research question 3. Table 5.4 shows the subjects that should be included in training to aid Civil Engineering supervisors in the interpersonal functions of their jobs.

TABLE 5.4

Significant Subject Areas: Interpersonal Skills

Subject Number	Subject Area
4	Motivation
13	Managing Conflict
15	Discipline

Research Question 4

"How does the need for these skills differ based on

- (a) base size
- (b) command?"

Tables 4.8 and 4.9 in Chapter 4 show the difference which were obtained using two ONEWAY ANOVA SPSS procedures on all thirty variables. This section will address only those subject areas which were found both significantly important and significantly different within the areas of base size and command.

Only four of the thirty variables showed any significant variance by base size (see Table 4.8). Of these only two were found to be of significant need . For subject area 14, Technical Update, large bases had a significantly lower mean than either small or medium bases. There was no significant difference, however, between small and medium bases on this subject. Supply Systems, subject area number 29 also showed a significant variance. In this case, small bases had a significantly higher mean than either medium or large bases. There was not a significant difference between medium and large bases. Overall, then , there was very little variance on the subject areas by base size.

The variances between commands were even smaller than those found by base size (see Table 4.9). Only three of the thirty variables showed any significant differences among the six different commands.[NOTE: Space Command had only one respondent and hence could not be included in the ONEWAY procedure.] Two of these subjects were also found to have significant value to CE supervisors. For subject area 7, Time Management, there was a significant difference in the responses from MAC and AFLC. MAC had a significantly lower mean than AFLC. There was no significant differences among any of the other commands on this area. Also, AFLC considered "Listening," subject

number 26, significantly more important than either MAC or SAC.

The results of these comparisons were not significant enough to warrant any further analysis of variance. There was low variation by base size and even lower variation by command. Although these variations do not impact the results of this research they may become important when a training program reaches the implementation phase.

Factor Analysis

The analysis of the data resulted in a relatively large number of subject areas that were found to have significant value to CE supervisors. As a result, the author determined that a factor analysis aimed at reducing and concentrating the significant subjects into more convenient packages was needed. A more complete discussion of the factor analysis procedure used is included in Appendix I. The result of the factor analysis was a model with six factors. The factors accounted for all significant variables with no cross loading.[Cross loading occurs when a variable is a member of more than one factor] The factors and the subjects included in them follow.

Factor 1: General Management Skills

Subject Area

5(General Management Principles)

6(Role of the First-Line Manager)

7(Time Management)

15(Discipline)

26(Listening)

Factor 2: Logistics Management

Subject Area

29(Supply Systems)

30(Vehicles)

Factor 3: Effective Writing

Subject Area

1(Effective Writing- General)

2(Effective Writing- Air Force)

Factor 4: Managing Civil Engineering

Subject Area

4(Motivation)

10(Civil Engineering Management)

12(Job Co-ordination)

13(Managing Conflict)

Factor 5: Personnel Administration

Subject Area

9(Civil Service Relations)

18(Manpower Authorization System)

Factor 6: Technical Review

Subject Area

14(Technical Update)

19(Superintendents Overview)

Therefore, by applying factor analysis to the results, the 17 significant subject areas can be fully described using only 6 composite factors. These factors may represent six different courses or sections of a single course. In any case, the subjects included within each factor should be taught or presented together.

Discussion of Factors

The factor analysis determined that the significant subject areas should be presented using six blocks or factors. This section each of those six factors.

Factor 1. Factor 1 was labeled "General Management Skills." It included the five subject areas of general management, role of the first-line manager, time management, discipline and listening. These five subjects are common to supervisors of all organizations. Civil Engineering supervisors would receive the same training in this block as any other first-line supervisor. As a result, these management skills are general to all managers.

Factor 2. Factor 2, "Logistics Management," includes the two subjects of supply systems and vehicle management. These two items represent resources to the

supervisor. The ability to understand and use the squadron's material control section as well as the ability to request, justify and receive vehicles are logistics functions. These functions are not generally a part of a Civil Engineering supervisors training.

Factor 3. The third factor is "Effective Writing." This factor includes general writing skills such as grammar, spelling, coherence, and format. In addition, this factor includes Air Force specific skills such as writing staff summary sheets, Airman Performance Reports, and trip reports. All forms of written communication would be covered by this factor.

Factor 4. "Managing Civil Engineering" is the fourth factor. This factor includes management skills that are more unique to Civil Engineering supervisors. Motivating craftsmen, and managing conflict between subordinates and other supervisors would be instructed within the context of Civil Engineering Squadron personnel. Further, the general skill described earlier would now be put into the CE light. Finally, effective job and work order co-ordination would be emphasized.

Factor 5. Factor 5, "Personnel Administration," covers the skills necessary to deal with the human as a resource. In this block the specific problems of civil servants, including their hiring, firing, promoting, and unions would be presented. Further, the manpower system to

include acquiring, funding, and filling positions would be taught.

Factor 6. The last factor is the "Technical Review." The technical update is provided to insure that once the supervisor is removed from his technical duties; he still retains the required technical knowledge to provide his superiors and subordinates adequate guidance and insight. Further, once an individual becomes a superintendent he must supervise crafts with which he is not familiar. The overview is designed to give him the knowledge of other crafts that he needs to be an effective manager.

VI. Conclusions and Recommendations

Introduction

This chapter contains a discussion of the conclusions drawn from the analysis in the previous chapters. Further, it discusses the limitations of these results. Finally, this chapter provides recommendations for both implementation and future research.

Conclusions

The conclusions discussed in this section are based on the assumption that the data received from the 60 respondents is not significantly different from that which would have been obtained with a 100 percent return. This assumption appears valid for several reasons. First, the 72.3 percent return rate is relatively high which indicates a good sample. Second, a comparative analysis of the parametric and rank ordering procedures revealed little difference. Of the 16 areas found significant by the t-test, 14 were in the top 16 by rank order. Hence the internal validity of the questionnaire was high. Third, there was almost no difference in responses between command or by base size. Finally, all 60 respondents answered the parametric portion of the survey completely and only two failed to perform the rank ordering task. This indicates widespread understanding of both the

subjects and the instructions in the survey among the respondents. There are four conclusions from this thesis. They are:

1. Chiefs of Operations perceive a need for increased managerial training for both military and civilian CE supervisors. This came as a result of the responses to Section 2 of the survey which is discussed in Appendix C.

2. Only one curriculum is needed for both CE supervisors (military and civilian superintendents and foremen) Air Force wide. This is for three reasons. First, there is almost no difference between the subjects that are needed by military supervisors and those needed by civil servants. In fact, there was a significant difference in only 5 of the 30 subject areas. Further, only three of these five were also found significant by the analysis techniques discussed previously. Those that were different are shown in Table 4.7. Second, there is almost no difference in the needs of these supervisors based on their parent command. In this case, only 3 of the 30 subject areas showed any significant difference. Of these, only one was also found significantly necessary for CE supervisors. The differences are, however, listed in Table 4.9. Finally, there is virtually no difference in their need by base size. There were only four cases in which there was a significant difference by base size. Two

of these four were also found significant by the tests discussed previously. A complete list of all difference is given in Table 4.8.

3. There are 17 subject areas, in which, CE supervisors require additional training. The 17 are shown in Table 6.1. A description of each of these subjects is provided in the survey instrument in Appendix A.

4. These 17 subject areas can be further reduced to six combined factors to form the model shown in Figure 6.1. A discussion of each factor and the subjects which make it up is included in Chapter 5.

Limitations

There are some limitations to the results of this research. Although these limitations do not invalidate the conclusions, they should be taken into consideration prior to any decision making based on the results of this thesis.

1. The most important limitation deals with the survey population. Due to time requirements resulting from the need for a union review of the questionnaire; the author was unable to ask superintendents and foremen for their opinions on their training needs. As a result, some important subject areas may not have been identified. Had time been available, a survey of CE superintendents and

TABLE 6.1
Significant Subject Areas

Survey Question Number	Subject Area
13	Effective Writing (General)
14	Effective Writing (Air Force)
16	Motivation
17	General Management Principles
18	Role of the First-Line Manager
19	Time Management
21	Civil Service Relations
22	Civil Engineering Management
24	Job Co-ordination
25	Managing Conflict
26	Technical Instruction
27	Discipline
30	Manpower Authorization System
31	Superintendents Overview
38	Listening
41	Supply Systems
42	Vehicles

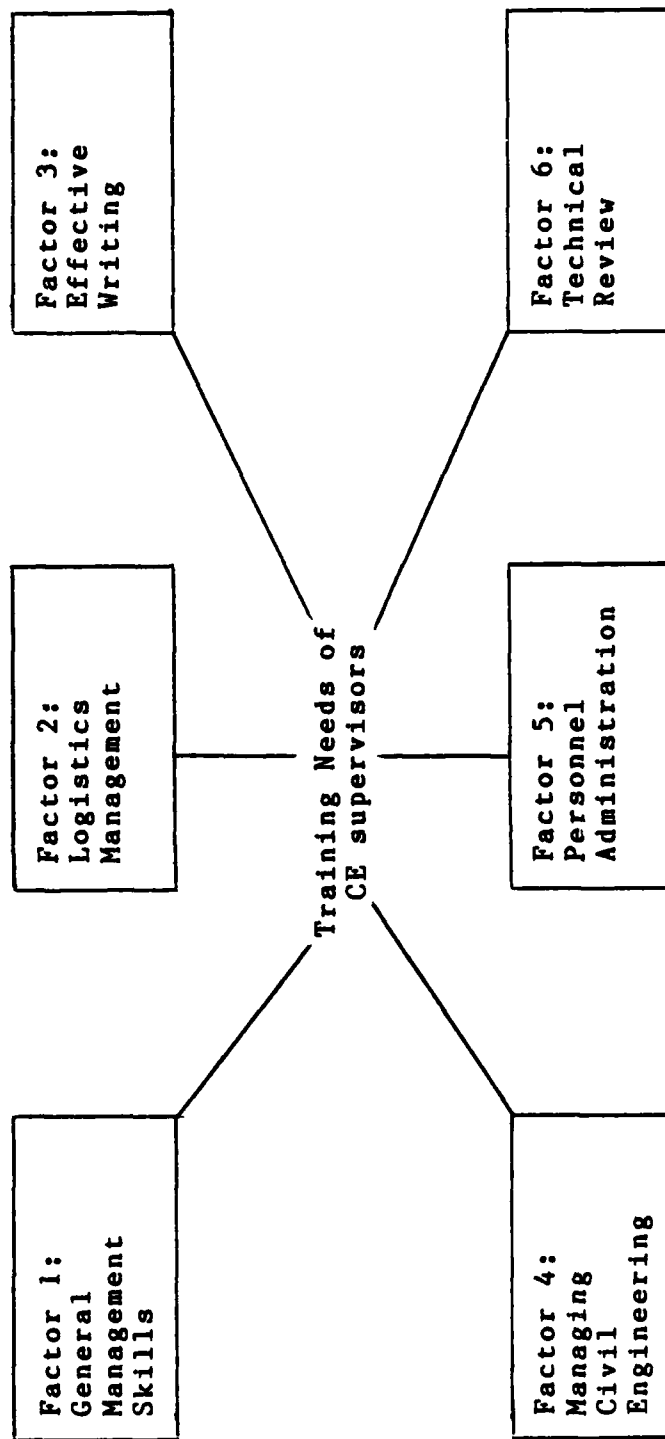


Fig. 6.1. Model of Training Needs For CE Superintendents and Foremen

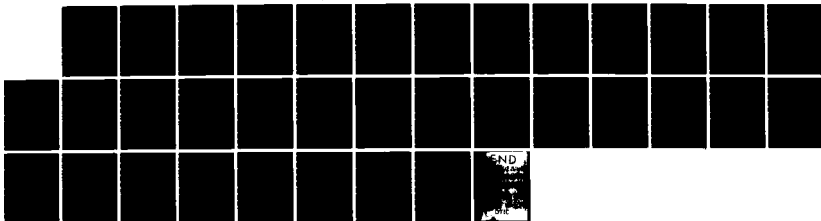
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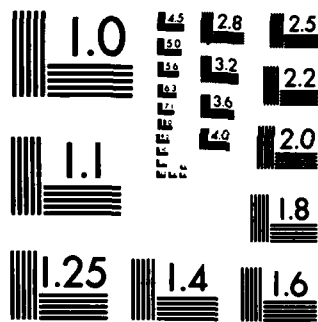
ANALYSIS OF TRAINING NEEDS FOR CIVIL ENGINEERING
SUPERINTENDENTS AND FOREMEN(U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF SYST. M A CORRELL
SEP 84 AFIT/GEM/LSM/84S-6 F/G 5/9

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foremen and a comparison to Chiefs of Operations would probably have provided more generalizable results.

2. Use of a five-point Likert scale was another restriction. The respondents were given a narrow range of options. As a result, the means were very close to each other and many subjects which were not significant at $\alpha = .05$ would probably be at $\alpha = .10$. It would have been better to have used a seven-point scale to allow for a wider range of responses(i.e., greater dispersion).

3. A third limitation was the short description of the subject areas. Since each subject was defined in only one or two sentences, some respondents may have been unsure of their importance. A better procedure would have been to attach a more detailed list of definitions to the questionnaire so that respondents would have had a clear idea of what each subject entailed. However, this might also have discouraged the respondents from participating by making the survey too large and cumbersome.

4. Finally, although the research was concerned only with peacetime functions, surveying only CONUS bases may inhibit the generalizability of the results. The increased training and wartime emphasis of overseas bases may impact the peacetime job. As a result, the subject area needs might be different at non-CONUS installations. If time had permitted, it would have been better to include non-CONUS bases.

Recommendations

1. The Civil Engineering training community should be made aware of the results of this research. This can be accomplished by:

a. Providing a copy of the thesis to the Dean, AFIT School of Civil Engineering. The School of Civil Engineering should review the content of this thesis as the basis for a new course or for inclusion in a current curriculum such as the Management Operations course.

b. Providing a copy of this thesis to the training section at the Engineering and Services Center, Tyndall AFB, FL. This satisfies their request for research in this area. The direct flying mission impact and large magnitude of the problem addressed in this research was discussed in the "Justification" section of Chapter 1. Considering the serious nature of this problem, the Engineering and Services Center should initiate action to insure that the necessary follow-on research to this report is completed. Further, they should begin planning for the addition of a management training curriculum, for superintendents and foremen, to its current training program.

2. Follow-on research should focus on the following:

a. For the 17 significant subjects, determine the depth of instruction required for CE supervisors.

b. Determine how much training, in these areas, CE supervisors are already receiving.

c. Create a curriculum based on the shortfall.

d. Determine how the curriculum should be presented (i.e. teleteach, TDY instruction, correspondence etc.).

e. Determine when in the supervisor's career it should be presented.

3. After the follow-on research is completed, implement a managerial training program for Civil Engineering superintendents and foremen.

Appendix A: Survey Package



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

REPLY TO
ATTN OF

LSH(AFIT/GEN/LSM/84S-6)/LT M. CORRELL/AUTOCVON 785-6569

SUBJECT

Survey of Subject Area Need for Civil Engineering
Superintendents and Foremen

TO

Chief of Operations

1. The attached questionnaire was prepared by a researcher at the Air Force Institute of Technology, Wright-Patterson AFB, OH. The purpose of the questionnaire is to acquire data concerning Civil Engineering Chief of Operations'/Superintendents' and Foremen's perceptions of subject areas that would be of value in a future managerial training program for Civil Engineering Superintendents and Foremen.

2. You are requested to provide an answer or comment for each question. Headquarters USAF Survey Control Number 94-42 has been assigned to this questionnaire. Your participation in this research is voluntary; however, failure to participate may lead to a less effective training program.

3. Your responses to the questions will be held confidential. Please remove this cover sheet before returning the completed questionnaire. Your cooperation in providing this data is appreciated and will directly impact the content of the future Superintendent and Foreman training program. Please return the completed questionnaire in the attached envelope within one week after receipt.


Larry L. Smith, Colonel, USAF
Dean
School of Systems and Logistics

3 Atch
1. Privacy Act Statement
2. Questionnaire
3. Return Envelope

AIR FORCE--A GREAT WAY OF LIFE

PRIVACY STATEMENT

In accordance with paragraph 8, 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. 8012, Secretary of the Air Force, Powers, Duties, Delegation by Compensation; and/or
- (3) EO 9397, 22 Nov 43, Numbering System for Federal Accounts Relating to Individual Persons; and/or
- (4) DOD Instruction 1100.13, 17 Apr 68, Surveys of Department of Defense Personnel; and/or
- (5) AFR 30-23, 22 Sep 76, Air Force Personnel Survey Program.

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 theses 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 presented orally, 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 not to participate in any or all of this survey.

BASE CODE A B C
COMMAND CODE A B C D E F G

Do not mark. For AFIT use only

INTRODUCTION

The purpose of this survey is to aid in the development of a training program for Civil Engineering Superintendents and Foremen. The survey has three parts. Section one is a short demographic section. The second section is designed to collect information for use in a before and after comparison when a training program is implemented. The last section will be used to determine the specific training areas that need to be included in a training program for superintendents and foremen. Please take your time and answer each question carefully. The accuracy of your answers will be a major determinant of the effectiveness of any training courses which result from this study. Your identity will not be revealed in any use of this data and your answers will remain confidential. At the time of mailing, your survey was marked to indicate the size of your base and its parent command. This information will be used for statistical analysis only. Your anonymity will not be compromised by this code.

SECTION 1 BIOGRAPHICAL DATA

INSTRUCTIONS: Circle the LETTER which corresponds to the appropriate response.

1. My rank is:
 - a. LT
 - b. CAPT
 - c. MAJOR
 - d. LT COL
 - e. OTHER _____
2. My Professional Military Education includes:
 - a. None completed
 - b. SOS (any method)
 - c. ACSC or equivalent (any method).
 - d. AWC or equivalent (any method).
 - e. Other _____
3. I have been a Chief of Operations for:
 - a. 3-6 months
 - b. 6 months - 1 year
 - c. 1-2 years
 - d. 2-3 years
 - e. more than 3 years
4. I have been in the Civil Engineering career field for:
 - a. 0-2 years
 - b. 2-4 years
 - c. 4-8 years
 - d. 8-12 years
 - e. more than 12 years

SECTION 2
BACKGROUND DATA

INSTRUCTIONS: Answer each of the following questions according to the answer key shown below. Circle the appropriate response. The term "adequate training" used in questions 7-12 is defined as a satisfactory quantity and a satisfactory quality of managerial training.

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

- | | |
|---|------------|
| 5. I think that in general, Civilian superintendents and foremen are hired primarily on the basis of managerial potential and exhibited performance (as a manager). | 1-2-3-4-5 |
| 6. I think that in general, Civilian superintendents and foremen are hired primarily on the basis of technical expertise and/or seniority. | -1-2-3-4-5 |
| 7. I think most civilian superintendents and foremen are adequately trained in managerial skills <u>before</u> being hired. | 1-2-3-4-5 |
| 8. I think most military superintendents and foremen are adequately trained in managerial skills <u>before</u> assuming their current assignment. | 1-2-3-4-5 |
| 9. I think most civilian superintendents and foremen receive adequate training in managerial skills <u>after</u> being hired. | 1-2-3-4-5 |
| 10. I think most military superintendents and foremen receive adequate training in managerial skills <u>after</u> they have been assigned as a superintendent or foreman. | 1-2-3-4-5 |
| 11. Civilian superintendents and foremen would gain very little from additional managerial training. | 1-2-3-4-5 |
| 12. Military superintendents and foremen would gain very little from additional managerial training. | 1-2-3-4-5 |

SECTION 3 TRAINING NEEDS

PART 1

INSTRUCTIONS: The following questions are designed to establish the specific subject areas in which Civil Engineering superintendents and foremen need additional/initial education. For each subject area, select the appropriate response from the key shown below. When answering, consider whether or not superintendents and foremen need the type of training described. Answer each question with respect to your civilian and military supervisors as separate groups. If you do not understand the subject area or do not feel qualified to give an answer, leave that line blank.

1. Virtually no need for this type of training
2. Small need for this type of training
3. Neutral (i.e. you understand the subject and feel that although there is some need for it, that need is not significant.)
4. Significant need for this type of training
5. Pressing need for this type of training

	CIVILIAN	MILITARY
13. Effective Writing. This will include instruction in basic grammar, spelling, and composition skills.	1-2-3-4-5	1-2-3-4-5
14. Effective Writing. This will include how to write APRs, JPAS, CPAS, correspondence, and other Air Force documents.	1-2-3-4-5	1-2-3-4-5
15. Stress Management. This will include instruction in how to manage the new pressures that are associated with the responsibility of supervision.	1-2-3-4-5	1-2-3-4-5
16. Motivation. This will include instruction in how to motivate subordinates for better performance.	1-2-3-4-5	1-2-3-4-5
17. General Management Principles. This will include broad instruction in the traditional management functions of planning, organizing, controlling, staffing, etc.	1-2-3-4-5	1-2-3-4-5
18. The Role of The First-line Manager. This will be a fundamentals course which would cover general management principles that are common to ALL first-line supervisors no matter what organization they are employed by.	1-2-3-4-5	1-2-3-4-5
19. Time Management. This will include principles of effective time organization and usage.	1-2-3-4-5	1-2-3-4-5
20. Leadership Topics. This would include instruction in leadership areas not already covered such as: professional ethics, personal appearance, and leading vs. commanding.	1-2-3-4-5	1-2-3-4-5
21. Civil Service Relations. This would include instruction in classification actions, downgrades, position descriptions, etc.	1-2-3-4-5	1-2-3-4-5
22. Civil Engineering Management. This would include instruction in management concepts as they apply to Civil Engineering.	1-2-3-4-5	1-2-3-4-5
23. Problem Solving Techniques. This will include instruction in how to break-up and solve problems.	1-2-3-4-5	1-2-3-4-5
24. Job Co-ordination. Instruction in effective co-ordination of multi-craft work and job orders.	1-2-3-4-5	1-2-3-4-5
25. Managing Conflict. Instruction in how to manage conflicts within the work area between subordinates, between the manager and subordinates, and between the manager and his superiors.	1-2-3-4-5	1-2-3-4-5

26. Technical Instruction. A technical update of new equipment for a trade area. This would be geared to give the supervisor a technical understanding of the new technologies in use from his craft. (ie. new circuits, new HVAC systems etc.).	1-2-3-4-5	1-2-3-4-5
27. Discipline. Instruction in how to effectively administer disciplinary actions.	1-2-3-4-5	1-2-3-4-5
28. Professional Counseling. How to counsel subordinates on professional problems.	1-2-3-4-5	1-2-3-4-5
29. Personal Counseling. How to counsel subordinates on personal problems. This will not teach the manager to solve the subordinates problems but how to control situations and who to refer the employee to for professional counseling.	1-2-3-4-5	1-2-3-4-5
30. Manpower Authorization System. This would include managing current authorizations, how new authorizations are created and other processes associated with acquiring and managing personnel.	1-2-3-4-5	1-2-3-4-5
31. Superintendents Overview. Instruction for SUPERINTENDENTS in the fundamentals of the crafts that they supervise but in which they have no experience. (For example: if an interior electric foreman becomes the electrical superintendent, he would get basic technical training in the exterior electric and power production crafts.)	1-2-3-4-5	1-2-3-4-5
32. Planning. Instruction in the methods of long range strategic planning.	1-2-3-4-5	1-2-3-4-5
33. Labor relations. This would include the inner workings of government unions including both employee and management rights and responsibilities.	1-2-3-4-5	1-2-3-4-5
34. Interaction. How to work effectively with other managers.	1-2-3-4-5	1-2-3-4-5
35. Political Pressures. Instruction in the reality of political gamesmanship in the Air Force and how to deal with it.	1-2-3-4-5	1-2-3-4-5
36. Financial Management. Instruction in Civil Engineering squadron budgeting and spending processes and procedures.	1-2-3-4-5	1-2-3-4-5
37. Speaking Skills. This will include how to give both informal and formal briefings.	1-2-3-4-5	1-2-3-4-5
38. Listening. Instruction in effective listening skills.	1-2-3-4-5	1-2-3-4-5
39. Overview of the Civil Engineering Mission. Will discuss how CE fits into the Air Force and base mission. Will include an explanation of Prime BEEF, the military's role in CE and the civilian's role in CE. This type of course will attempt to show the superintendents and foremen how their shop fits in and why CE has the procedures it does.	1-2-3-4-5	1-2-3-4-5
40. Promotion Systems. Will include instruction on the military promotion system for civilian supervisors and the civilian promotion system for military supervisors.	1-2-3-4-5	1-2-3-4-5
41. Supply Support System. Will include instruction on the type of systems (such as COCESS, GOCESS, CEMAS) to include how to order, follow-up, and the material control work flow.	1-2-3-4-5	1-2-3-4-5
42. Vehicles. Will include an explanation of the VAUB, vehicle authorizations, requests, and assignment policies.	1-2-3-4-5	1-2-3-4-5

INSTRUCTIONS: In the next section, rank order the top ten subject areas from PART 1. For example, if you feel that speaking skills are the most needed skill for superintendents and foremen, place the number "32" in the column headed SUBJECT AREA directly across from rank "1".

1 (Most important topic)	_____
2.	_____
3	_____
4	_____
5	_____
6.	_____
7	_____
8	_____
9	_____
10 (10th Most important topic)	_____

INSTRUCTIONS: In the space below please list any other areas in which you feel Civil Engineering superintendents and foremen need training. If you suggest a subject area and you feel it should be in the top 18 subject areas, indicate where (1-18) you would have ranked it if it has been one of the original choices. DO NOT change the ten answers you gave in PART 2. THANK YOU FOR YOUR ASSISTANCE!

Appendix B: List of Bases by Size

Small Bases (<4000)

(coded A on survey questionnaire)

<u>Base</u>	<u>Number of Personnel*</u>
1. Blytheville	3332
2. Bolling	2719
3. Brooks	2600
4. Columbus	3927
5. England	3713
6. Grissom	3802
7. Goodfellow	1581
8. Gunter	2478
9. Hancock Field	1133
10. Hurlburt	3917
11. Laughlin	3523
12. Myrtle Beach	3725
13. Reese	3426
14. Vance	2600
15. Whiteman	3574
16. Wurtsmith	3491

*Combined military and civilian personnel assigned as reported in Air Force Magazine, May 1983.

Medium Bases (4000-7500)

(coded B on survey questionnaire)

<u>Base</u>	<u>Number of Personnel*</u>
1. Altus	4355
2. Barksdale	7198
3. Beale	4801
4. Bergstrom	5965
5. Cannon	8195
6. Carswell	5954
7. Castle	5424
8. Dover	6483
9. Dyess	5614
10. Ellsworth	6752
11. F. E. Warren	4049
12. Fairchild	4836
13. George	6292
14. Grand Forks	5607
15. Griffiss	6741
16. Hanscom	5037
17. Holloman	7038
18. Homestead	6964
19. K. I. Sawyer	4866
20. Little Rock	6950
21. Loring	4111
22. Luke	7300
23. Malmstrom	4378
24. March	5013
25. Mather	7300
26. Maxwell	6185
27. McConnell	5079
28. McChord	7406
29. McGuire	6600
30. Minot	6334
31. Moody	4099
32. Mountain Home	4878
33. Pease	4131
34. Peterson	4497
35. Plattsburg	4445
36. Pope	4560
37. Seymour-Johnson	5992
38. Shaw	6117
39. Tyndall	5448
40. Williams	4370

*Combined military and civilian personnel assigned as reported in Air Force Magazine, May 1983.

Large Bases (> 7500)

(coded C on survey questionnaire)

<u>Base</u>	<u>Number of Personnel*</u>
1. Andrews	10995
2. Chanute	8400
3. Charleston	8462
4. Davis-Monthan	7816
5. Edwards	8517
6. Eglin	14928
7. Hill	19599
8. Keesler	16926
9. Kelly	23597
10. Kirtland	18515
11. Lackland	26352
12. Langley	10968
13. Lowry	15122
14. MacDill	7592
15. McClellan	18000
16. Nellis	10349
17. Norton	8529
18. Offutt	16028
19. Patrick	9978
20. Randolph	7886
21. Robins	19324
22. Scott	10286
23. Sheppard	9353
24. Tinker	24000
25. Travis	11363
26. Vandenberg	12815
27. Wright-Patterson	24000

*Combined military and civilian personnel assigned as reported in Air Force Magazine, May 1983.

Appendix C: Results and Discussion of Section 2
of the Survey Questionnaire

Introduction

The background questions asked in Section 2 of the survey questionnaire were not directly used in this thesis. This appendix discusses the results and conclusions drawn from this section.

Background questions were asked for two reasons. First, to validate three underlying assumptions to this research. In Chapter 1, the author asserted that civilian Civil Engineering superintendents and foremen are hired primarily based on technical performance and not on managerial potential. Further, it is implied in Chapter 1 that neither military nor civilian CE supervisors receive adequate managerial training in their careers. Finally, it is assumed that managerial training would be of value to CE supervisors. The second reason for this section was to create an unbiased database of opinions. After implementation of a training program these responses could be compared to new ones to see if the program is successful.

The same parametric t-test with Likert data was used as that which was discussed in Chapter 3. This test, however, was to measure agreement or disagreement. The results will be discussed by the assumptions they tried to validate.

Results

The first two questions (numbers 5 and 6 on the survey in Appendix A) attempted to validate the assumption that civilian CE supervisors were hired on technical ability rather than managerial potential. Based on the mean of 3.083 for question 5 the author could not conclude that managerial potential was not a significant factor in hiring. However, the responses to question 6 were adequate to conclude that the primary factor in hiring civilian superintendents and foremen is technical expertise and/or seniority.

The middle four questions (numbers 7-10) attempted to establish the adequacy of current managerial training before and after assumption of supervisory positions for both civilian and military supervisors. The results indicated that neither civilians nor military personnel receive adequate managerial training prior to assuming supervisory roles. Further, respondents felt that neither group received adequate training after selection.

Finally, there was an overwhelming feeling among respondents, that managerial training would be of benefit to CE supervisors. Only 1 of the 60 respondents agreed that civilian supervisors would not gain from this type of training. In addition, only 5 of the 60 agreed that military supervisors would not benefit.

Conclusions

It is not clear whether or not managerial factors are generally considered when civilian supervisors are hired. However, it is certain that, when taken together, technical expertise and seniority are the major factors. The current attitude among CE Chiefs of Operations is that superintendents and foremen are not receiving adequate managerial training during their careers. Finally, both military and civilian superintendents and foremen would benefit from managerial training.

Based on the above results, the author concluded that this and future research in the area of management training for CE supervisors is warranted.

Appendix D: Input Form

ENGINEERING MANAGEMENT THESIS OF LT MARK CORRELL

TITLE: ANALYSIS OF TRAINING NEEDS FOR CIVIL ENGINEERING SUPERINTENDENTS
AND FOREMEN

PROBLEM STATEMENT: This thesis will focus on the educational deficiencies of current supervisory training programs. In particular, it will address the fact that the educational needs, with respect to management functions and interpersonal skills, of Civil Engineering superintendents and foremen are not being met.

INSTRUCTIONS: In the space that follows please describe those skills in which you feel CE superintendents and foremen are deficient. Be as specific as possible. For example, if you feel that they are weak in the area of written communication then state which specific tasks are poorly accomplished such as APRs, position descriptions, or correspondence.

GENERAL COMMENTS: Please add any inputs which you feel will aid me in my research. Thanks for your help.

Appendix E: Data Files

This appendix contains the returned survey files used to perform both the parametric and the non-parametric analysis. Blank spaces in the files indicate that the respondent did not answer that question or questions. The two files are in parallel order (i.e. the first entry in both files is from the same survey).

In file A, immediately following this page, the following format applies:

<u>Data File</u>	<u>Survey Question</u>
Columns 1-4	1-4
Columns 5-6	Base/Command Code
Columns 7-14	5-12
Columns 15-44	13-42(Civilian)
Columns 45-74	13-42(Military)

In file B, two pages over, the following format applies:

<u>Data File</u>	<u>Survey</u>
Columns 1-2	1(Most Important Topic)
Columns 3-4	2
Columns 5-6	3
Columns 7-8	4
Columns 9-10	5
Columns 11-12	6
Columns 13-14	7
Columns 15-16	8
Columns 17-18	9
Columns 19-20	10(10th Most Important Topic)

Data File A

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Data File B

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22384241343728292715
22143621263033414240
31394142302226211833
19384127241328351825
32244116422914192228
13141731182630414240
17192535321518201413
14212013212430403336
13202529332737413929
18162515381413292636
13143042212231264140
41133138241626202417
16142531272219284018
13141930212434273826
13192523343729153814
18151917302327341413
15223137393029231340
41427640131416197425
26364117232218151413
39313641221817263021
35413014153642192318
14131824252636414230
20131430273819164221
35152725272642413031
17221331351418192530
19301424223125231615
18383536342829301624
14393134373821251642
39142437421613302640
14161727193236413029
31131430264134363742
28273013141920291841
13172315162425354118
39312217381314193524
13142430332221171842
19293833201334372441
13143527161839223634
41423013142236242133
14131622172327403521
13312841392022141837
34412416221733251342
19151416243830314126
18172214203341383940
13141932373822244123

Appendix F: Suggested Additional Subject Areas

This appendix contains the five subject areas that were submitted via the open ended question in the survey questionnaire. Each suggestion is listed under the research question that it is most applicable to. The numbers in parentheses after the subject title represent the placing in the rank ordering (1-10) that the suggestor/s indicated.

Research Question 1: General Management Skills

No topics were submitted that fall under this research question.

Research Question 2: CE Unique Skills

1. Equipment Acquisition (7,9) - "Included in this item could be special financing available for equipment and evaluation/testing procedures performed by AFESC."

2. Planning Section (2) - "... to inform the superintendents and foremen of the planners function."

3. Project Review - "Shop's responsibility to insure that the best design is obtained from design agencies for projects in the shop's area of responsibility."

Research Question 3: Interpersonal Skills

1. Social Action - "Drug and alcohol counseling for civilian and military personnel."

2. Integrity (5) - "Its importance."

Appendix G: Analysis of Variance (ANOVA)

The analysis of variance (ANOVA) technique is a statistical process which is used to compare the means of populations with respect to one or more factors. The test is used to determine if one or more of the means is significantly different from the others when divided into groups by factor. (McKnight and Parker, 1983).

Similarly to the t-test, the ANOVA procedure establishes null and alternative hypotheses (Meek and Turner, 1983). For ANOVA the null hypothesis usually states that the means are all equal (Meek and Turner, 1983). This hypothesis is then tested at some significance level, usually .01 to .05, against the alternate hypothesis which says that at least one mean is significantly different from the others (McKnight and Parker, 1983). If the null hypothesis is rejected, the analyst can conclude that at least one of the means is different from the others. However, the reader should note that using a significance level of .01 to .05 means that there is some chance that there will be a Type I error (McKnight and Parker, 1983). A Type I error occurs if the null hypothesis is rejected when in fact it should not be (Meek and Turner, 1983).

The ANOVA technique may be used to evaluate the impact of one or more independent variables (factors) on

the dependent variable. The ANOVA subprogram in the SPSS package allows up to five simultaneous factors. In this research, however, the author was interested in only two factors and their separate impacts on the means. As a result, the subprogram ONEWAY was used. ONEWAY is a standard ANOVA procedure which is run on only one factor. Hence, it was more appropriate than the ANOVA subprogram. (Nie et al., 1975).

Appendix H: Validation of Interval Data*

Traditionally, the statistical analysis data has been based upon the assumption that the data can be classified into one of four groups. Classical statistics assumes that data may be classified as either nominal, ordinal, interval, or ratio level data. Nominal level data is considered to be the lowest form of data, while ratio level data is considered the highest. The type of statistical tests which may be applied against the data are dependent upon the level of the data (Harnett, 1982).

The four traditional levels of data are distinguished on the basis of the ordering and distance properties inherent in the measurement rules. With nominal level data, numerical values may be assigned to the data, but no comparisons can be made between the data points. With ordinal level data, it is assumed that the data can be rank ordered. That is, the data can be arranged in ascending or descending sequence. Nothing can be said, however, about the relative distance between the data points. It is only with interval level and higher data that we can begin to compare one numerical value with

*This appendix is reprinted in its entirety from the masters thesis of Captains McKnight and Parker, 1983. All citations contained within this appendix are listed at the end of the discussion.

another. Interval level data assumes an exact knowledge of the quantitative differences between the objects being measured. This type of scale is concerned primarily with the distance between those objects. With ratio level data proportional difference become significant or valuable. Ratio level data has all of the properties of the lower levels of data. In addition, ratio level data has an inherent or assumed zero point (Harnett, 1982).

As a minimum, the data from the mailed questionnaire is ordinal level data. However, parametric statistical analysis requires at least interval level data (Harnett, 1982). Unfortunately, social science research primarily deals with opinions or attitudes. Measures of responses for these attributes are difficult to classify as interval level data. A valid question then, is the appropriateness of using parametric statistical analysis on less than interval data.

Twenty-five years ago, statistical texts would have given a definitive answer to this question (Gardner, 1975). Arguments since then, however, have blurred the distinction between ordinal and interval data. Many statisticians now argue that parametric techniques for ordinal data are appropriate if the data at least approximates interval level data. Gardner (1975) concludes:

1. The distinction between ordinal and interval

scales is not sharp. Many simulated scales yield scores that, although not strictly on interval strength, are only mildly distorted versions of an interval scale.

2. Some of the arguments underlying the assertion that parametric procedures require interval strength statistics appear to be of doubtful validity.
3. Parametric procedures are, in any case, robust and yield valid conclusions even with mildly distorted data.

Nie et al. (1975) go a step further and define a level of data as ordered metric or partially ordered data. This level of data falls between ordinal and nominal categories and consists of data where the intercategory distances are known even though their absolute magnitude cannot be measured. Other statisticians argue that "proper assignment of numeric values to the categories of an ordered metric scale will allow it to be treated as though it were measured at the interval level" (Nie et al., 1975, p.6). It is further argued that, except for extreme situations, interval statistics (parametric statistics) may be applied to any ordinal level data (Nie et al., 1975).

Professor McNichols (1980) argues that,

Although there are always risks inherent in deliberately violating assumptions in statistical analysis, very few of the multivariate analysis results reported in the behavioral sciences could be justified if rigid adherence to interval scale requirements were observed. (McNichols, 1980, p. 19)

Therefore, Likert scale data is often considered to be ordered metric, and parametric analysis techniques may be

used in analyzing the results of this type of data
(McNichols, 1980).

The authors [author] feel [feels] these arguments
justify the assumption of at least interval level data and
the use of parametric analysis techniques in this study.

Works Cited in Appendix H

Gardner, P. L. "Scales and Statistics," Review of Education Research: 43-57 (Winter 1975).

Harnett, D. L. Statistical Methods (3rd ed.). Reading MA: Addison-Wesley Publishing, 1982.

McNichols, C. W. An Introduction To: Applied Multivariate Data Analysis. Wright-Patterson AFB OH, 1980.

Nie et al. SPSS Statistical Package For the Social Sciences. New York: McGraw-Hill, 1975.

Appendix I: Factor Analysis

The purpose of this appendix is to give a brief description of the factor analysis process used in this thesis. Factor analysis is not a single procedure but in fact a collection of techniques (Nie et al., 1975). In general, the goal of factor analysis is to reduce an initial large set of variables into a new set of factors (Coleman, 1984). These new factors contain, as their members, the highly correlated variables from the original set (Coleman, 1984). There are four general characteristics of the factors that result. First, the variables within a factor should have very similar themes or be compatible in some way (Tucker, 1981). Second, a large proportion of the variance explained by the initial set of variables should also be explained by the new factors (Tucker, 1981). Third, the factors should be independent in that the contents of one factor should not affect the contents of another (Tucker, 1981). Finally, the result should be one that does not clash with intuitive perceptions (Tucker, 1981).

There are three basic steps in any factor analysis. The first step is the preparation of a correlation matrix (Nie et al., 1975). The purpose of this step is to establish how the correlation between variables will be measured (Nie et al., 1975). Then the possible data

reduction avenues are investigated (Nie et al., 1975). Finally, the values are rotated to provide readily interpretable results (Nie et al., 1975).

In this thesis the author used the PA2 subprogram of the SPSS package. This subprogram provides an initial factoring based on the three steps from above. However, it then updates the correlation matrix with new communality estimates. This iteration process continues until the new communality values are not significantly different from the previous iteration's values (Nie et al., 1975).

There are two basic outputs of this program. The first is a list of the variables and their associated eigenvalues. There are a variety of techniques to determine the number of factors to be used. This thesis, however, used the Kaiser criterion which includes only those number of factors with an eigenvalue greater than one (McKnight and Parker, 1983). Once the number of factors is determined the subprogram gives factor loadings for each variable in each factor. These factor loadings indicate how much of the variance in that factor is accounted for by that variable (Nie et al., 1975). As a result, high positive values indicate that a variable should be included in a particular factor. It is common to include variables with factor loadings greater than .4 in that factor (McKnight and Parker, 1983). As a result, this thesis used the .4 convention.

Bibliography

- Austin, T. W. "What Can Managers Learn From Leadership Theories," Supervisory Management, 22-31 (July 1981).
- Chobot, Richard B. Integration of Lower Level Supervisors into the Management Structure, 31 August 1981. Directorate of Civilian Personnel, Department of the Army.
- Fayol, Henri. General and Industrial Management (English title) Trans. Constance Starrs, 1925; reprinted 1968, New York: Pitman Publishing Company, 1968.
- "Fewer Grievances With Autocratic Supervisors," Management Review, 53 (May 1978).
- Forbes, Capt Donald R. No Title (acquired from Captain Ben Dilla, AFIT/LSB, Department of Organizational Sciences). Unpublished report. Air Force Institute of Technology School of Systems and Logistics, Wright-Patterson AFB OH, September 1983.
- Halloran, Jack. Supervision: The Art of Management. Englewood Cliffs NJ: Prentice-Hall, Inc., 1981.
- Harrison, E. Frank. Management and Organizations. Boston: Houghton Mifflin Co., 1978.
- Hayes, J. L. "How Competent Managers Work With People," Management Review, 2-3 (March 1980).
- Inman, T. H. et al. "Analysis of the Effectiveness of a Management Training Program," Training and Development Journal, 84 (June 1982).
- Kinney, W. E. "Technology and the Human Imperative: Both Are Needed," Office, 114 (January 1982).
- Koontz, Harold. "The Management Theory Jungle Revisited," Academy of Management Review, 5: 175-187 (1980).
- . Management- A Systems and Contingency Analysis of Managerial Functions. New York: McGraw-Hill Book Co., 1976.

- McKnight, Capt Richard D. and Capt Gregory P. Parker. Development of an Organizational Effectiveness Model for Base Level Civil Engineering Organizations. MS thesis, LSSR 13-83. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1983 (AD-A134 950).
- Mandt, E. J. "Basic Model of Managerial Development," Personnel Journal, 395-398 (June 1979).
- Meek, Gary E. and Stephen T. Turner. Statistical Analysis for Business Decisions (Second Edition). Boston: Houghton Mifflin Co., 1983.
- Nie, Norman H. et al. Statistical Package for the Social Sciences (Second Edition). New York: McGraw-Hill Book Co., 1975.
- Plachy, R. J. "Leading vs Managing: A Guide to Some Crucial Distinctions," Management Review, 58-61 (September 1981).
- "Problems Facing First-time Managers," Advanced Management Journal, 52 (Spring 1983).
- Sallee, Capt Robert J. Development of Possible Guidelines to Assist USAF Operative Employees Transitioning to First-Time Supervisory Positions. MS thesis, GSM/SM/75S-9. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1975.
- Schoen, Sterling H. and Douglas E. Durand. Supervision: The Management of Organizational Resources. Englewood Cliffs NJ: Prentice-Hall Inc., 1979.
- Student, K. R. "Back to Basics for Improved Human Resource Management," Management Review, 51-56 (August 1978).
- Szilagyi, Andrew D. and Marc J. Wallace. Organizational Behavior and Performance (Third Edition). Glenview IL: Scott, Foresman, and Company, 1983.
- Toth, Edward R. Jr. "Common Sense Management," National Defense, 47-50 (September 1982).
- Tucker, Alan E. M. Factor Analysis. Unpublished Technical Paper, Ohio State University, Columbus OH, February 1981.

U.S. Department of the Air Force. Operations and Maintenance of Real Property. AFR 85-10. Washington: U.S. Government Printing Office, 14 October 1975.

U.S. Department of the Air Force. Military Training Standard Promotion Fitness Examination. AFP 50-34. Washington: U.S. Government Printing Office. 1 October 1982.

Watson, C. M. "Leadership, Management, and the Seven Keys," Business Horizons, 8-13 (March-April 1983).

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