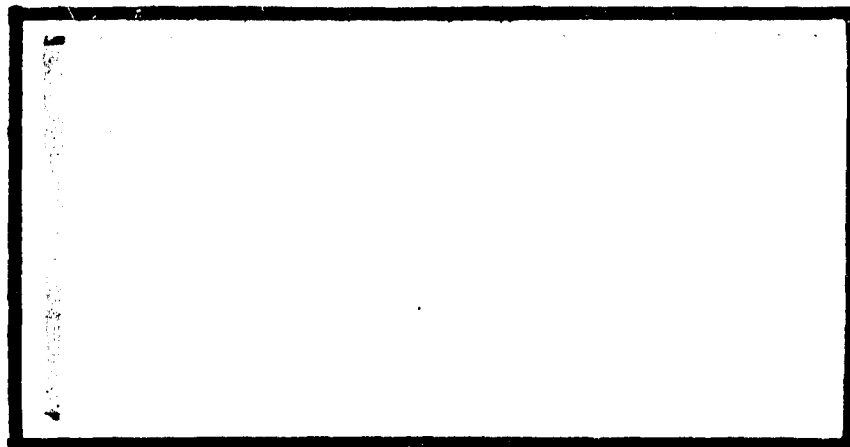


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9 Master's thesis

6 A COMPARISON OF THE USEFULNESS OF THE FACILITIES MANAGEMENT PROGRAM IN THE GRADUATE SCHOOL OF SYSTEMS AND LOGISTICS AND SIMILAR PROGRAMS IN CIVILIAN INSTITUTIONS AS PERCEIVED BY FORMER STUDENTS.

10 Grantland W. Johns, Major, USAF
Philip M. Ray, Captain, USAF

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This research involved an analysis of the usefulness of the Facilities Management Program in the Graduate School of Systems and Logistics and similar programs in civilian institutions. The major objective was to evaluate the advantages of a graduate degree in Facilities Management (FM) from the Air Force Institute of Technology (AFIT) versus similar programs in civilian institutions (CI) based on the perceptions of former graduates of these programs. A survey questionnaire was constructed and mailed to active duty Civil Engineering officers who had completed one of these programs. Of the 83 FM graduates and 50 CI graduates who were sent this questionnaire, a total of 96 were returned (72.2 percent). A thorough analysis of the collected data was made utilizing various computer programs. The general conclusions reached consisted of the following: there is a need for graduate management education in the Air Force for Civil Engineers; CI programs are providing an equivalent education in the context of course content and their programs are useful; the current FM program is current and relevant, however, it does need to be changed slightly to meet the demand of today's civil engineering manager.

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FORMER STUDENTS

A 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 Facilities Management

By

Grantland W. Johns, BS
Major, USAF

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June 1980

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This thesis, written by

Major Grantland W. Johns

and

Captain Philip M. Ray

has been accepted by the undersigned on behalf of the faculty of the
School of Systems and Logistics in partial fulfillment of the require-
ments for the degree of

MASTER OF SCIENCE IN FACILITIES MANAGEMENT

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COMMITTEE CHAIRMAN

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CHAPTER I

INTRODUCTION

Statement of the Problem

"Can the Department of Defense justify the continuation of millions of dollars of funding for graduate officer education [19:218]?"

In 1976 while the U.S. House of Representatives' Committee on Appropriations was considering the Department of Defense appropriations bill, they stated that ". . . a large portion of the graduate education program is not really essential to the military services [20:62]." Again in 1979, this same committee quoted a study published by Rand Corporation which stated that the

. . . average industry middle manager has received far less instruction than his military counterpart at each comparable stage of development, be it junior manager, middle manager, or executive . . . A senior military officer receives more formal training than does a senior business executive [20:62].

These questions, statements, and studies express the congressional concern toward the number of military graduate education programs. Since it appears that Congress doubts the need for the amount of graduate education received by military managers, it is extremely vital for the Air Force Institute of Technology (AFIT) to evaluate the

relevancy of all programs, both at the resident school and civilian institutions, to insure the need for these graduate programs in the Air Force. The Facilities Management Program is one of the programs that requires continued evaluation.

Definitions

At the start of this research study, it is important to define several terms so that a common frame of reference will be used.

The following words will be used as defined:

1. useful/usefulness: capable of being put to use; having utility; advantageous (10:2524).
2. similar: having characteristics in common; very much alike; comparable (10:2120).
3. relevant: bearing upon or properly applying to the matter at hand; pertinent (10:1917).
4. equivalent: like in significance; corresponding or virtually identical; synonymous (10:769).

Background

AFIT traces its foundation to the early days of powered flight. Very early it became evident that as technology increased, more and better education was required. Through the years AFIT

has become the primary manager of Air Force advanced education programs (22:3).

As Air Force requirements have changed, the AFIT programs have been modified to provide the latest available material.

In 1973, an illustration of such a change occurred when Facilities Management was added to the AFIT graduate degree programs. This program was added as a direct result of the recommendation of the 1972 Civil Engineering Panel of the Air Force Educational Requirements Board which made the following comment:

Engineering master's degree requirements reflect the continuing growing complexity in facility design and construction. The emphasis on engineering management reflects the concern of commands for engineers to make the transition from engineer to engineer-manager [14:7].

Thus, it became evident that there was increased need for graduate management education in civil engineering.

Additionally, Air Force civil engineering officers are also sent by AFIT to non-resident programs at various civilian institutions to obtain graduate degrees in some type of civil engineering management.

Justification

The stimulus of World War II resulted in the worldwide growth of American industry to such an extent that there was an unprecedented need for managers. Along with this growth in industry

came the increase of workers in very significant numbers (11:140).

The complexities of industrial operations created management problems that were parallel to the problems encountered in the military services (11:141).

Therefore, it was evident that there was an increasing need for additional education that would enable managers to cope with the increasing complexities as found in industry and the military services. However, there are diverse approaches to solving this need for increased information. The military system of schooling is formalized and is a part of every officer's career (11:164). But, the educational opportunities for industry managers and executives are markedly less (11:165).

However, there are two different outlooks of the two groups involved. The military deals with matters of life and death. Industry deals in balance sheets and are only concerned with profits (11:179).

Congress continually takes an interest in the management of the officer corps but has paid little attention to the management of industry's managers (11:179).

Through the years there has been various concerns about the need for a military force. During each war the personnel requirements have vastly increased but immediately after each war there has been a drastic reduction of the armed forces. There is a tendency in society to prefer to spend funds on social costs rather than

defense. In a speech to the AFIT faculty and students in October, 1979, Admiral Isaac C. Kidd, Jr., made the comparison of defense spending to insurance costs. He stated that the U.S. population buys insurance to protect their families and possessions against injury or loss at much greater cost than we are prepared to fund the defense of our whole future way of life (13).

The effect of congressional interest concerning the funding of defense versus the funding of social programs has caused decreased availability of funds to properly defend the free world.

In December, 1978, Deputy Secretary of Defense Charles W. Duncan expressed his concern when he stated that the Soviet Union's military effort has been continuously increasing over the past 15 years at an annual rate of between four and five percent. As the U.S. defense spending has decreased, the Soviet Union's expenditures have continued to go up. The Soviets are presently spending between 11-30 percent of their gross national product on defense while the U.S. is spending 5 percent. He emphasized that our main weapons against the Soviet quest for world dominance are going to have to be ". . . superior technology and greater efficiency [6:32]."

As defense funds have continued to decrease, the Department of Defense has been forced to direct its energy toward improved management of the available resources. One method by which DOD has endeavored to improve management is by increasing the

availability of management tools for managers. This is partially being accomplished through the graduate education program. However, this program has also come under close scrutiny by Congress. In response to one Congressional question concerning funding of graduate education, a DOD representative declared that graduate education helps to ensure that we maintain our position of leadership in the free world. Also it was stated that graduate education gives an enhanced sense of personal worth and the costs are offset through savings in recruiting and training new officers (19:218).

As in all areas of the DOD, the Air Force must improve the management of its use of the limited available resources. AFIT helps to accomplish this goal through the many graduate programs that it offers in the various disciplines.

Civil engineering is one of those areas that has seen the need for advanced education for its managers. The former Director of Civil Engineering, Major General Robert C. Thompson, stated that civil engineering (CE) was going to have to do more with less. "The future holds great promise and unprecedented opportunity for those who acquire the training, both technical and professional, and develop the skills necessary for effective management [18:1]."

Since USAF civil engineering is responsible for the operation and maintenance of approximately \$17.8 billion worth of Air Force base facilities throughout the world at an annual expenditure of

approximately \$1.3 billion, effective management has a significant impact on how well these resources are utilized (8:2).

Thus it is imperative that the civil engineering officer be adequately prepared to meet this ever-increasing challenge for improved management. Therefore, the Facilities Management Program must be periodically evaluated to ensure that the latest management tools are being provided to the program graduates.

Literature Review

The problem identified for this study was to evaluate the usefulness of the Facilities Management Program as perceived by graduates of this program. The majority of the research completed in this general area has been accomplished by AFIT graduate students. Therefore, a review of these prior research studies would be beneficial in order to become familiar with other approaches.

In August, 1974, Majors Meri-Akri and Walton (14) wrote a thesis concerning the advanced degree requirements in the civil engineering career field. In their problem statement they stated:

There currently exists considerable confusion as to the actual type of work done by Air Force civil engineering officers with Air Force Specialty Code (AFSC) 55XX. Eighty-five percent of these individuals currently possess a baccalaureate degree in engineering, however, many of the activities of the career field are of a managerial rather than a classical engineering nature. This confusion is most evident in the area of advanced academic degree requirements for civil engineer officers and results in some officers being afforded

advanced management degrees while others are afforded advanced engineering degrees [14:1].

Their purpose was to determine the type of advanced degree most required by Air Force civil engineers. The data they analyzed was primarily obtained through a job survey of 44 percent of the Air Force civil engineering officers in August, 1971. This data was acquired from the Air Force Human Resources Laboratory, Occupational Research Division (14:24). Meri-Akri and Walton concluded that 66.3 percent of an Air Force civil engineering officer's working time was spent in performing management type work and the remaining 33.7 percent of their working time was spent performing engineering tasks (14:24). Through their survey they formed the opinion that a bachelor's degree in engineering is ample technical education to permit performance of the majority of engineering work required of Air Force Civil engineering officers. They further stated that a limited need does exist for more advanced degrees in engineering specialties but that these degrees should be utilized in areas such as teaching and research and development. In their conclusion they felt that all other advanced academic degrees for civil engineering officers should be management degrees (14:26).

In August, 1975, Captain Julich and First Lieutenant O'Connell (12) completed a student thesis on the Advanced Academic Degree Management System (AADMS). Their purpose was to

determine if the AADMS as it then existed was providing an adequate method of identifying and establishing advanced academic degree requirements that were needed to accomplish the Air Force mission. The data collected for this thesis consisted of a survey of officers in the Air Force Logistics Command that were manning validated "graduate degree required" positions. They concluded:

There is a definite need within the Air Force for people with advanced degrees. Graduate education is important to advance the state of the art in both technical and managerial fields. This need is directly related to the mission of the Air Force . . . to provide national security and deterrence of military actions which are counter to the interest of the United States [12:60-61].

In September, 1977, Captains Gauntt and Stann completed research in the area of evaluating civil engineering educational needs (9). They surveyed 486 civil engineering base level managers in order to obtain their opinions on the type of degree and level of education which they thought were necessary to accomplish their jobs. Through this survey they concluded that 63.7 percent of civil engineering managers needed a minimum of at least a bachelor's degree in an engineering discipline. The remaining 36.3 percent felt that a degree in management or some other area would be sufficient to accomplish their jobs (9:30). A summary of their thesis conclusions follows (9:40-42):

1. Most, but not all, individuals entering Air Force civil engineering should have at least a bachelor's degree in an engineering discipline.

2. The base level management positions needing master's level education should have as many non-technical as technical degrees.

3. For those surveyed, there were more military managers with master's degrees than military jobs needing master's degrees.

4. There were five courses that were rated as being needed and also found to have been completed by less than 50 percent of the respondents. They were:

- a. Energy Conservation
- b. Contracting for Civil Engineers
- c. Environmental Resources Management
- d. Financial Management
- e. Economic Analysis for Civil Engineers.

5. These were six courses that were rated as being of little value to the base level engineering manager. They were:

- a. Micro Economics for Defense Planning
- b. Probability and Statistics
- c. Distribution Management
- d. Principles of Accounting
- e. Research
- f. Statistics II.

Their thesis conclusions are significant because the survey consisted of only active duty Air Force civil engineers. On the other hand, their population's educational background varied widely due to both academic level and type of degree.

In June, 1978, Captain Crowder and Davidson conducted a research effort stating the usefulness of the Graduate Logistics Program (4). Their purpose was, "to analyze the extent to which graduates of the many USAF-sponsored graduate education programs are using those skills attained through or precipitated by the graduate study process [4:1]." Their survey population consisted of responses from 217 AFIT resident school graduates and 185 of their supervisors.

The former student group was graduated during the 1971-1975 time period. In their conclusions, the authors stated that as a group, the respondents felt that the graduate programs had been useful (6:57). The term useful was defined as, ". . . education is useful if it is of practical use in job performance [4:14]."

In June, 1979, Captains Brown and Hollingsworth completed a student research thesis in which they analyzed the usefulness of the Graduate Logistics Program as perceived by graduates from classes 1963 through 1978 (4). The data collected was limited to the opinions of active duty Air Force officers who are graduates of AFIT resident graduate management programs. They received 845 responses which represented 81 percent of the questionnaires that were mailed. A summary of their conclusions is as follows (2:57-59):

1. Graduates felt their promotion chances had increased as a result of attending AFIT.
2. Graduates felt that the AFIT Graduate Logistics Program was useful overall to themselves and to the Air Force.
3. Graduates perceived their supervisors' feelings to be favorable to the AFIT program.
4. Overall, graduates felt that the courses offered at the School of Systems and Logistics were useful in their jobs.
5. Overall, graduates felt their assignments to be inappropriate in light of the education they had received.

Brown and Hollingsworth used the term "usefulness" as, "education is useful if it is of perceived practical use in the graduate's job performance [2:18]."

In their analysis of curriculum usefulness, from a choice of

26 courses, they found the following courses to be (2:34):

<u>Most Useful</u> (ascending order)	<u>Least Useful</u> (descending order)
1. Speech	22. Simulation
2. Writing	23. Cost and Reliability
3. Organizational Behavior	24. Macroeconomics
4. Analytical Techniques	25. International Logistics
5. Organization and Management	26. Computer Programming

In summary, this literature review has presented the most pertinent material in the same topical area of this research effort. All of the former theses reviewed, dealt in the area of the AFIT School of Systems and Logistics. Although all of these prior efforts are generally applicable to our proposed topic, none of them deal precisely with our problem area. We believe this to be the first research paper specifically analyzing the Facilities Management Program.

Research Objectives

The main objective is to evaluate the advantages of a graduate degree in Facilities Management from AFIT versus similar programs in civilian institutions. Supporting objectives are to:

1. Determine the usefulness of the AFIT Facilities Management Program.
2. Determine the usefulness of similar programs offered through civilian institutions.

3. Determine whether or not changes are needed in the present Facilities Management curriculum.

Research Questions

Questions concerning Air Force civil engineering managerial requirements that are addressed in this effort are:

1. Is there a need for graduate management education in the Air Force for civil engineers?
2. Are the similar programs offered through civilian institutions providing equivalent education?
3. Are the courses offered in the AFIT Facilities Management Program current and relevant?
4. Are the courses offered by civilian universities in Engineering Management or similar programs useful?
5. Does the Facilities Management Program need to be changed to meet the demand of today's civil engineering manager?

CHAPTER II

METHODOLOGY

Introduction

Having stated the basic problem and objectives of this research effort, attention is now focused on the procedures to be followed in answering the research questions. First, the population was specifically defined and then the methods of obtaining the required information were investigated. A survey questionnaire was deemed most appropriate for this study. Along with the construction of the questionnaire the type of statistical test needed for analysis was determined. The assumptions and limitations of this effort were then made for the analysis process.

Population

Survey participants were initially identified as active Air Force civil engineering officers who had completed a graduate level management curriculum through AFIT. This single group or universe included both resident and civilian institution graduates. Air Force Manual (AFM) 36-19 classified these officers when they initially obtained their degrees as either IAGA or IAGY (Advanced Academic

Degree Codes). Therefore, the universe was subdivided into these two independent populations. Specifically AFM 36-19 defines these graduates as (21:A1-3),

MS Degree: Engineering Management (Academic Code: 1AGY); The recipient of the master's degree has completed a course of advanced studies in engineering management showing intellectual competence in advanced management mathematical concepts. He has completed an area of concentration in one of the following aspects of engineering management: management principles, operational research, quantitative methods, engineering production, financial controls or computer techniques. Generally speaking, the graduate in engineering management has the management and mathematical knowledge to provide answers to questions or problems in his field.

MS Degree: Facilities Management (Academic Code: 1AGA); The recipient of the master's degree has completed the AFIT School of Systems and Logistics in the area of Facilities Management.

The next consideration in surveying these graduates was their respective year of graduation. The Facilities Management Program was initiated in 1973, with the first class of 14 students graduating in 1974. Through the last graduating class in 1979, the total number of graduates of this program was 128. With the assistance of the AFIT Consolidated Base Personnel Office (CBPO), it was discovered that 83 of these officers were presently filling Air Force civil engineering jobs throughout the USAF.

The resident AFIT Registrar's Office provided a listing of the second population consisting of 1AGY graduates. This group was limited to graduates since 1970 in order to better correlate with the

time frame of the IAGA population. Of the 85 graduates since 1970, 52 of them were filling positions in Air Force civil engineering.

Both of these populations were reduced even more due to the following reasons:

1. Those in the process of accomplishing a permanent change of station were deleted for the obvious reason of practicality.

2. Due to unknown reasons of separation, persons with a date of separation prior to 1 March 1980 were excluded. The authors thought they might bias the survey.

With the above eliminations from the populations, the survey instrument was then sent to 83 facility management graduates and 50 civilian university graduates. Since this study will be descriptive of the perceptions of these two groups of officers pertaining to their graduate education, the research questions were answered from those responses received. No inferences will be made concerning the total population of graduates due to the above stated reasons of elimination and bias.

The Survey Instrument

General

After considering the various survey instruments, it was determined that the mailed questionnaire would be most appropriate for this particular research effort. In determining the appropriateness

of the questionnaire, several advantages and disadvantages were noted.

One of the main advantages of the mailed questionnaire was that the population was widely scattered over a large geographical area and this method allowed the population to be easily reached. Another decided advantage is that the questionnaire uses the least amount of time for the research team. Additionally, the cost in using the questionnaire is relatively low compared to using the other survey instruments. The survey populations can easily be reached through their office address. Often, more time can be used in answering the questionnaire, helping to assure that each question is carefully considered. In addition, a respondent may be more likely to give personal information in an unsigned questionnaire than in a personal interview. Also, there is no interviewer present to bias the answers by incorrectly recording the information (3:96).

Although the mailed questionnaire was considered to be the most practical survey instrument for this research, some disadvantages do restrict its use and were considered. A relatively large percentage of mailed questionnaires may not be returned and therefore it may be difficult to determine the degree of representativeness of the survey. Also, the number of questions omitted or incorrectly answered may bias the survey. Much valuable additional information that could be received by personal interview will not be secured by

the mailed questionnaire (3:96). But the authors believe that these disadvantages do not present significant problems in this study.

Questionnaire Structure

In order to measure the perceptions of the two populations, a fixed-response and open-end questionnaire was developed. The fixed-response questions were used so that comparisons could be made between the two groups as measured by their responses to the various questions. The open-end questions were developed to provide the research team with additional insight about the populations and possibly a more conclusive study (1:385).

The questionnaire (Appendix A) was divided into four sections: background information, educational usefulness/job requirements information, assignment/promotion information, and open-end questions. Under the background information section, the questions were adapted from the Brown/Hollingsworth thesis study (2).

The background information section (questions 1-8) is concerned with gathering descriptive information such as the organizational level, current grade, years in civil engineering, and the date of completion of the master's degree requirements of each respondent.

The education usefulness/job requirements information section (questions 9-44) contains questions concerned with the usefulness or appropriateness of the Facilities Management Program

curriculum and the requirements of the graduates' jobs held since graduation. This section was designed to provide information concerning the usefulness of the management programs for civil engineers as perceived by the two populations in relation to their jobs. Also this section provided information concerning the relevancy of the courses in the Facilities Management Program as well as selected courses from civilian universities. This section was developed by using graduate catalogs from each of the following universities.

1. University of Alaska, Fairbanks
2. University of Missouri - Rolla
3. University of Southern California
4. Rensselaer Polytechnic Institute
5. The University of Arizona
6. The University of Texas at Austin
7. Vanderbilt University
8. The University of Dayton

From each of these schools an engineering management curriculum or similar program was evaluated to determine what additional courses could possibly be useful to graduates of Facilities Management. These courses were then combined with courses from the AFIT School of Systems and Logistics curriculum. The questions were then constructed around the course content and not around course title. This method was used so that both populations would

have a common basis for evaluating each question.

The assignment/promotion information section (questions 45-50) contains questions intended to provide information about the assignments of the two populations immediately after receiving their master's degree and their follow-on assignments. Additionally, the questions were asked concerning the promotion history in secondary and primary zones.

The last section was concerned with open-end questions (questions 51-54) which allowed the respondent to make further comments. Question 52 was designed to give information about the educational background of respondents who attended civilian institutions. Question 53 was written so that specific comments could be received about general civil engineering needs, statistical uses, and operational research uses. Question 54 was used for any other comments that the respondents might desire to make. These open-end questions were informally analyzed and helped to provide a measure of questionnaire validity.

Measurement Scale

In order to provide a measure of the desired information needed to answer all of the research questions, a measurement scale had to be used. Scaling is defined as, "the process of developing a measurement standard whereby individuals may be compared relative

to one another regarding the properties they possess [1:185]."

The seven-point Likert scale was chosen as the most appropriate measure to be used for the majority of the questionnaire. The Likert scale is an itemized scale in which the respondents have a choice ranging from Strongly Disagree to Strongly Agree for a given statement of fact. According to Emory (7:239) an itemized scale provides more information and meaning to the rater. He also states that "the reliability of the questionnaire is probably increased because the more detailed statements help the respondents to develop and hold the same frame of reference as they use the form [7:239]."

There are several advantages in using a Likert scale (1:194):

1. Easy to construct and interpret.
2. Most common measurement found used in social research today.
3. Flexible in that it increases the ability of the instrument to reveal differences in the trait measured between individuals as group size increases.
4. Lends itself to ordinal measurement, therefore numerous statistical techniques are available for analytical use.

Also there are several disadvantages in using a Likert scale (1:195):

1. No consistent meaning can be attached to the raw scores derived by such measurement.
2. Each response of the seven-point scale does not have identical weight in relation to every other response.
3. Persons receiving the same score on a measure do not necessarily possess the trait to the same degree.
4. The validity of summated (itemized) ratings is questionable due to the possibility of not measuring what was intended to be measured.

In weighing these advantages versus disadvantages it was decided that the Likert scale would provide the desired answers to the research questions. This is further discussed in the statistical test section which follows in this chapter.

In order to analyze the data received by using the Likert scale for the questionnaire, the next point of interest was in properly analyzing the data statistically. The difficulty herein was in the question of whether to use nonparametric or parametric techniques. The basic premise of these two techniques is that they use ordinal and interval level data, respectively. Thus the basic problem was to decide which category best fit the data collected from the respondents. Black and Champion state that the Likert scale definitely produces ordinal data (1:194). Emory agrees and further states, "we can report respondents are more or less favorable to a topic, but we cannot tell how much more or less favorable they are [7:250]." Therefore having established that the instrument used would produce ordinal level data, nonparametric procedures were investigated.

Of the many references read, the following statement best summarizes the uniqueness of nonparametric techniques as applicable to ordinal data (15:6):

Nonparametric statistical procedures require few assumptions about the distribution or level of measurement of the variable and may be applied to nominal and ordinal data. The parametric procedures, on the other hand, theoretically require more stringent assumptions concerning the distribution

of the data (usually an assumption of normality), and they are designed primarily for data on an interval or ratio level of measurement.

This statement was generally in agreement with the philosophy of conservative statisticians. Therefore, the analysis of the ordinal data from the survey instrument has been accomplished using strictly nonparametric techniques.

Validation

The validation of this questionnaire was established in several different ways.

1. Some of the questions had been validated in previous thesis efforts.
 2. The questionnaire was evaluated by five members of the AFIT resident teaching staff who had previous experience in questionnaire construction.
 3. The questionnaire was administered to a test group of individuals familiar with both the academic environment and the civil engineering environment.
- Several questions (13/25, 11/24, 31/44) were constructed as redundant questions so that the respondents consistency in answering the questionnaire could be established.

The two populations being considered, IAGA and IAGY, had not been surveyed previously and therefore there were no known facts

about the two populations that could be used to validate the populations until after the questionnaire had been returned and analyzed.

Distribution

The AFIT CBPO provided a computer generated listing of all active duty civil engineering officers in the two populations. Each of the members of the two identified populations was sent a survey package that included a questionnaire, computer answer sheet, and a preaddressed return envelope.

In order to effectively gain valid data, the survey instrument was distributed in a manner which assured anonymity. Because of the anonymity in using the questionnaire, a second mailing was not attempted.

Statistical Test

Having established an ordinal level of data and stating that nonparametric procedures would be followed for analytical purposes, the advantages and disadvantages of using nonparametric techniques are discussed prior to stating the specific methodology of analysis. According to Siegel the advantages and disadvantage are (17:32):

Advantages:

1. Tests are available for testing samples made up of observations from several different populations. None of the parametric tests can handle such data without requiring us to make seemingly unrealistic assumptions.
2. Nonparametric tests can test ordinal and nominal data.

3. Tests are easier to learn and to apply than parametric tests.

Disadvantage:

1. If all the assumptions of the parametric statistical model are in fact met in the data, and if the measurement is of the required strength, the nonparametric statistical tests are wasting data.

Daniel (5:16) concurs with Siegel and further states that the chance of nonparametric procedures being used improperly is very small. Since the underlying assumptions of the surveyed populations are minimal, the advantages of nonparametric procedures far outweigh the disadvantage.

In order to work with the data received from the respondents, the answer sheets were read through the use of an optical-scan device. The recorded responses were then stored in a computer file for statistical testing purposes.

The raw data consisted of responses A through G in accordance with the established questionnaire. The Statistical Package for the Social Sciences (SPSS) subroutine NONPAR (nonparametric) (15:288) was used for analytical purposes. For this program the response data of A through G had to be recoded in the format of a numerical scale. Since the Likert scale consisted of seven points, each point was simply assigned a numerical value of between 1 and 7. Thus, a response to Strongly Agree equals a 7 and a response to Strongly Disagree equals a numerical value of 1 with the other

responses as appropriate between 1 and 7.

The primary means of ordinal level data correlation that will be used in this analysis is by summing the responses. Black and Champion state, "it is a simple matter to sum the responses to individual statements and derive a total score that may be compared with other scores on the same instrument [1:194]." Since the ordinal scale is referred to as a ranking scale, the calculation of means (averages) and standard deviations is not permissible because the scaling distances are not equidistant (17:26). Therefore, the analysis consisted primarily of summing responses.

In order to answer research question one, an evaluation of the responses to questions 9 (advanced degree usefulness) and 10 (job requires an advanced degree) was primarily used to evaluate the respondents' perceptions. The respondents were divided into two groups. Group 1 consisted of all Facility Management graduates and group 2 consisted of all civilian university graduate students as previously defined. The responses to questions 9 and 10 were then divided into those officers who agreed (E, F, or G), disagreed (A, B, or C), or had no opinion as defined by the Likert scale. The level of agreement or disagreement was not considered. The number of persons which agreed versus the number of persons which disagreed was then calculated by either group 1 or group 2, to determine if there was a discernible difference in their opinions.

Survey questions 6 (current job has an advanced academic degree code), 45 (degree was considered in initial assignment), and 46 (degree was considered in following assignments) were also used to answer research question one to determine the manner in which the Air Force had utilized the graduates. The data was evaluated in the same manner as stated above.

The data from questions 6, 9, and 10 was further evaluated through computer analysis to determine if there were any trends or bias because of level of assignment (question 1), years in civil engineering service (question 4), year of graduation (question 7), and promotion data (question 50). (See Chapter 3.) The information evaluated for research question one stands on the stated summary of the respondents.

Research questions two, three, four, and five were evaluated primarily through the use of Kendall's Rank Correlation Test (16:155). It is a measure of the strength of relationship between two sets of rankings. The statistical hypotheses for this research effort are:

H_0 : The perceived usefulness of the Facilities Management Program courses and civilian institution program courses are independent.

H_1 : There is a positive correlation between the perceived usefulness of the courses of the two programs.

The desire of this thesis is to determine whether the two groups of

graduates perceive the usefulness of the curriculum courses in a similar manner. The course rankings that were evaluated were determined by group 1 and group 2 respondents. The basic procedure was as follows:

1. The curriculum survey questions 11 through 43 were analyzed by summing the responses to each respective question.
2. The 33 courses were ranked within the two groups (same as before). Their respective ranks were established by comparing the sum for each particular course. (See Chapter 3.)
3. Kendall's correlation by ranks was calculated in order to determine whether or not there was a correlation between the two groups.
4. The range of values for Kendall's correlation coefficient (Tau) is between +1 and -1 (17:223). These values were interpreted as follows:
 - a. +1 or values near--strong direct correlation between rankings.
 - b. -1 or values near--strong opposite correlation between rankings.
 - c. 0 or values near--no correlation exist, therefore unrelated rankings.
5. If the data shows a strong direct correlation, then both group 1 and group 2 will be combined and one master grouping will

be produced. If the data shows either a strong opposite correlation or no correlation, then the rankings by group 1 and group 2 will be retained separately.

6. For either of the two cases above, a comparison will then be made with the curriculums offered in the Facilities Management Program and civilian university programs. This will show the extent to which these two programs are offering the needed courses as perceived by the graduates.

7. If there is a discernible difference in the programs, this will be shown by the value of Kendall's Tau.

The last group of questions evaluated were the open-ended questions 51 through 54. These will be analyzed by the authors and reported in the conclusion.

Assumptions and Limitations

The assumptions are:

1. Survey respondents took the time to adequately consider each response and then answer honestly.
2. Nonresponse of some of the target population did not affect the conclusions of the research effort.
3. The responses received are drawn from an underlying continuous distribution (17:25).
4. The questionnaire was a reasonably valid and reliable

measurement tool.

The limitations included:

1. Conclusions applied only to the respondent population.

No statistical inferences were attempted concerning the overall population.

2. Responses to the open-end questions were analyzed and interpreted in accordance with the judgment of the authors.

CHAPTER III

ANALYSIS

Questionnaire Response Rate

As mentioned in Chapter II, 128 officers had completed the Facilities Management Program and 85 had completed similar programs in civilian universities. Of those that had completed these programs, 83 officers from the Facilities Management Program and 50 officers from similar programs at civilian universities were identified for participation in this survey. Of the 133 questionnaires mailed, 96 questionnaires were returned for a return rate of 72.2 percent. Of the 96 returned, four were unusable and thus only 92 respondents will be used in the analysis. Out of the 92 respondents, 57 had completed the Facilities Management Program (FM) and 35 had completed similar programs in civilian universities (CI).

Questionnaire Analysis

Part I: Background

From the background information section questions concerning organizational level, current grade, years in civil engineering, year of graduation, advanced academic degree coding of

job, and aeronautical rating were answered by each respondent.

The organizational level of the respondents was primarily squadron or below (42.4%) or major command headquarters (26.1%) as Table 1 indicates.

TABLE 1
ORGANIZATIONAL LEVEL

Level	FM	CI	Total
Squadron or below	24	15	39
Group	2	4	6
Wing	3	2	5
Numbered Air Force	1	1	2
Major Command Hqtrs	16	8	24
HQ Air Force	4	2	6
DOD	1	1	2
Separate Operating Agency	6	1	7
Other	0	1	1

The current grades of the respondents were primarily captain (54.3%) and major (27.2%) as Table 2 indicates.

TABLE 2
CURRENT GRADE

Grade	FM	CI	Total
2Lt	0	0	0
1Lt	3	0	3
Capt	34	16	50
Maj	16	9	25
Lt Col	4	7	11
Col	0	3	3

Of the 92 respondents, the number of years of civil engineering experience ranged throughout the continuum with the least number of respondents being in the over 20 year category which is to be expected.

TABLE 3
YEARS IN CIVIL ENGINEERING

Years	FM	CI	Total
5 or less	18	10	28
10 or less	22	8	30
15 or less	11	8	19
20 or less	4	6	10
Over 20	2	3	5

Table 4 shows the various years of graduation for both the Facilities Management Program and the graduates from civilian universities. The majority of the graduates in the 1974 or before categories were from civilian universities. In the 1975 or after categories the Facilities Management Program assumed increasing importance in AFIT graduate education.

TABLE 4
YEAR OF GRADUATION

Year	FM	CI	Total
1972 or before	0	7	7
1973, 1974	7	9	16
1975, 1976	10	3	13
1977	14	0	14
1978	15	10	25
1979	11	6	17

Question 6 asked the respondents to determine if their present job has an advanced academic degree code. Of those that gave an opinion, 57.7 percent said that their job was coded with an advanced academic degree code (AADC) and 42.3 percent said their job was not coded with an advanced academic degree code.

TABLE 5
JOB HAS ADVANCED ACADEMIC
DEGREE CODE

Opinions	FM	CI	Total
Yes	33	8	41
No	16	14	30
I do not know	8	11	19

The last information that was requested from the respondents in the background information section concerned the aeronautical rating of the respondents. Out of the 92 respondents, 21 (22.8%) were rated and 71 (77.2%) were nonrated. In this rated group 16 officers were pilots and five officers were navigators.

Part II: Education Usefulness/
Job Requirements Information

In this section the programs of both the Facilities Management and civilian university graduates will be analyzed to determine the perceptions of the respondents.

Question 9 asked the respondents to determine how they perceived the usefulness of their advanced degree. The majority of the respondents (83.7%) agreed that an advanced degree is useful and only a small percentage (15.2%) disagreed. Out of the 57 Facilities

Management graduates, 78.9 percent agreed that the degree was useful and 19.3 percent did not perceive the degree as useful. From the 35 civilian university degree holders, 91.4 percent perceived that the degree was useful and 8.6 percent disagreed with the usefulness of the degree.

TABLE 6
USEFULNESS OF DEGREE

Opinions	FM	CI	Total
Agree	45	32	77
No Opinion	1	0	1
Disagree	11	3	14

The usefulness of the degree and the level of assignment was also compared but it was determined that there were no trends or bias that would affect the analysis.

Next, the usefulness of the degree and the years of civil engineering experience were compared. There was a very distinct trend between the perceptions of people with ten years or less experience and those with experience over ten years. Of those with over ten years experience in civil engineering, 97.1 percent agreed that the degree was useful. Of those with ten years or less experience

only 75.9 percent perceived that the degree was useful.

TABLE 7
USEFULNESS OF DEGREE BY YEARS
IN CIVIL ENGINEERING

Opinion	5 yrs or less	More than 5 but less than 10	10 but less than 15	15 but less than 20	20 and over	Total
Agree	25	19	19	9	5	77
No Opin- ion	0	0	0	1	0	1
Disagree	3	11	0	0	0	14
Total	28	30	19	10	5	92

Then the usefulness of the degree and the year of graduation were compared. Only 15.2 percent of the former graduates perceived the degree as not being useful. Of the 14 respondents who disagreed with the usefulness of the degree, 11 were graduates of the Facilities Management Program.

Next, the usefulness of the degree and the number of promotion passovers for the respondents who gave an opinion to this question were compared in order to determine if those who had been passed over could have biased the responses. However, of the nine people who had been passed over for promotion, eight agreed that the

degree was useful.

After concluding analysis of question 9, question 10 was analyzed. It asked the respondents to determine the requirement for an advanced education for their job. Out of the 49 Facilities Management graduates who gave opinions, 49 percent agreed that their job required an advanced degree, but 51 percent perceived that their job did not require an advanced degree. Of the 30 civilian university graduates who gave opinions, 60 percent perceived that their job required an advanced degree and 40 percent disagreed with the requirement for an advanced degree. The group percentages for this question were 45.7 percent agreed, 14.1 percent had no opinion, and 40.2 percent disagreed.

TABLE 8
JOB REQUIRES ADVANCED DEGREE

Opinions	FM	CI	Total
Agree	24	18	42
No Opinion	8	5	13
Disagree	25	12	37

Next, a comparison between the requirement for an advanced degree and the level of assignment was made to determine any trends

or bias were present in the responses. The majority of the respondents were either at a major command headquarters or at a squadron or below level. Of those who gave an opinion and were at a major command headquarters, 57.9 percent perceived that their job did not require an advanced degree and 42.1 percent agreed that their job did require an advanced degree. Of those who gave an opinion and were at squadron or below levels 51.5 percent did not agree that an advanced degree was required for their job and 48.5 percent agreed that their job did require a degree. Due to the low response rate in other levels of assignment, no trends or bias were noted.

TABLE 9
JOB REQUIRES ADVANCED DEGREE BY
LEVEL OF ASSIGNMENT

Opinions	Squadron or Below	Gp	Wg	Num- bered AF	MAJ COM	HQ AF	DoD	Separate Operating Agency	Other
Agree	16	4	1	2	8	3	2	5	1
No Opin- ion	6	0	1	0	5	1	0	0	0
Disagree	17	2	3	0	11	2	0	2	0

The next area of comparison for the requirement for an advanced degree was with years of civil engineering experience. Of the 48 respondents under ten years experience, 47.9 percent agreed that

their job required an advanced degree and 52.1 percent perceived that their job did not require an advanced degree. Of the 31 respondents that had more than ten years of experience, 61.3 percent agreed that their job required an advanced degree and 38.7 percent disagreed. Of the 79 that gave opinions, 53.2 percent agreed that their job required an advanced degree and 46.8 percent disagreed. Of those in civil engineering 15 years or less, 63 percent agreed that their job required an advanced degree.

TABLE 10
JOB REQUIRES ADVANCED DEGREE BY YEARS
IN CIVIL ENGINEERING

Opinions	5 or less	10 or less	15 or less	20 or less	Over 20
Agree	12	11	12	6	1
No Opinion	5	5	2	0	1
Disagree	11	14	5	4	3

Next, the requirement for an advanced degree for the job was compared to the respondent's year of graduation. Of the graduates prior to 1978 who gave opinions, 63.6 percent perceived that their job required an advanced degree and 36.4 percent disagreed. Of those in the 1979 and 1978 year groups who gave opinions, 40 percent

agreed that their jobs required advanced degrees and 60 percent disagreed.

Again promotion passovers were checked to determine if any bias or trend had been caused by this response but again none were noted.

Finally, to conclude the analysis of questions 9 and 10, degree usefulness (question 9) and requirement for an advanced degree for the job (question 10) were compared. Out of the 77 who agreed on the usefulness of the degree, 31.2 percent disagreed on the requirement of an advanced degree for the job and 54.5 percent agreed.

TABLE 11
USEFULNESS OF DEGREE BY JOB
REQUIRES ADVANCED DEGREES

		Job Requires Advanced Degree		
		<u>Agree</u>	<u>No Opinion</u>	<u>Disagree</u>
Usefulness of Degree	Agree	42	11	24
	No Opinion	0	0	1
	Disagree	0	2	12

The curriculum survey questions 11 through 43 were analyzed by summing the responses to each question within the two main categories of FM and CI graduates. Table 12 shows the rankings as determined through computer analysis. In order to see the

apparent correlation which does exist, the table includes both sets of rankings. This correlation will be discussed later. Included in the table are the ranks, sum of responses, and course titles followed by the number of the survey question which applied to the course.

The sums shown in Table 12 were then used as the input to the computer for the calculation of Kendall's Tau (t). The computer output provided a value of $t = 0.533$ within a significance level of 0.1 percent. In order to make a decision based on the stated hypothesis, Daniel's text (5:467) was used. It shows the critical value of t (referred to as t^*) to be 0.394, based on 33 cases and within a significance level of 0.1 percent. The term critical value is the actual accept or reject value to be used for comparison. Our hypotheses and decision rules were as follows:

H_0 : the FM ranking and CI ranking are independent

H_1 : $t > 0$; there is a positive correlation between the two sets of rankings

If $t \leq t^*$, accept H_0

If $t > t^*$, reject H_0

Since $t = 0.533$ and $t^* = 0.394$, then $t > t^*$, therefore H_0 was rejected. The conclusion reached is that there is an approximately direct (positive) relationship between the rankings. Realizing that there is a less than 0.1 percent chance of having reached the wrong conclusion, the responses to the survey questions (11 through 43)

TABLE 12
COURSE RANKING AS DETERMINED
WITHIN EACH CATEGORY

FM		CI		Name of Course (Question Number)
Rank	Sum	Rank	Sum	
1	369	2	211	Writing (39)
2	350	3	206	Speech (32)
3	333	1	219	Organizational Behavior (21)
4	329	15	152	Financial Management (17)
5	325	4	202	Organizational Management (20)
6	311	9/10	166	Economics for C.E.'s (29)
7	309	5	200	Leadership Theory (30)
8	309	27	132	C.E. Contracting (41)
9	306	8	180	Counseling (40)
10	306	6	191	Management Information System (43)
11	305	25	134	Energy (36)
12	303	28/29	130	Environmental Analysis (37)
13	300	11	160	Operations Research I (25)
14	299	7	185	Engineering Decision Making (22)
15	291	9/10	166	Statistics I (24)
16	288	23	141	General Logistics (42)
17	287	19/20	145	Thesis (31)
18	277	19/20	145	Research Method (19)
19	274	16	151	Labor Relations Management (27)
20	270	24	135	Civil Engineering-General (12)
21	259	18	149	Macroeconomics (18)
22	258	13	155	Operations Research II (13)
23	249	22	142	Computer Programming-Writing (14)
24	249	21	144	Reliability Engineering (23)
25	248	12	158	Work Measurement (28)
26	245	26	133	Statistics II (11)
27	242	31	121	Programmable Calculator (16)
28	238	28/29	130	Safety Engineering (26)
29	237	14	153	Management and Production Mgt (33)
30	233	17	150	Accounting (38)
31	211	30	125	Computer Operations-Canned (15)
32	200	32	110	System Dynamics (34)
33	187	33	100	Experimental Design (35)

were then interpreted without dividing the respondents into the two stated groups.

The ranking shown in Table 13 is the result of summing all responses to the specific course questions. This is the final combined master ranking of courses as perceived by the FM and CI graduates when viewed as one total population.

Table 13 contains the sums of the responses, the rank of each course as determined by the sum, and the course titles with their respective question number. The table also shows two other columns labeled FM and CI with the ratings of R, -, and O. These ratings reflect the state of the curriculum for the specific categories. R means that the course is a required course, O means that the course is optional, and a - signifies that the course is not offered. The current FM curriculum (1979-1980) was used for this comparison. For the CI category, the catalogs from various universities (shown in Chapter II) were used for the comparison on the basis of whether or not the majority of the schools offered these courses.

One additional subject was considered in this section. The graduates were asked their opinion of the usefulness of having to write a thesis. Of the 67 who had written a thesis, 71.6 percent agreed that the writing and research involved in completing a thesis had been useful to them and 17.9 percent disagreed.

TABLE 13
COURSE RANKING BY ALL
RESPONDENTS

Sum	Rank	FM	CI	Name of Course (Question Number)
580	1	-	O	Writing (39)
586	2	O	O	Speech (32)
552	3	R	R	Organizational Behavior (21)
527	4	R	R	Organizational Management (20)
509	5	O	-	Leadership Theory (30)
497	6	R	-	Management Information Systems (43)
486	7	-	R	Counseling (40)
484	8	-	R	Engineering Decision Making (22)
481	9	R	-	Financial Management (17)
477	10	R	R	Economics for C.E.'s (29)
460	11	R	R	Operations Research I (25)
457	12	R	R	Statistics I (24)
441	13	R	-	C.E. Contracting (41)
439	14	R	O	Energy (36)
433	15	R	O	Environmental Analysis (37)
432	16	R	O	Thesis (31)
429	17	R	-	General Logistics (42)
425	18	O	O	Labor Relations Management (27)
422	19	R	O	Research Methods (19)
413	20	R	O	Operations Research II (13)
408	21	R	O	Macroeconomics (18)
406	22	-	R	Work Measurement (28)
405	23	-	-	Civil Engineering-General (12)
393	24	-	R	Reliability Engineering (23)
391	25	R	R	Computer Programming-Writing (14)
390	26	R	-	Management and Production Mgt (33)
383	27	R	O	Accounting (38)
378	28	R	O	Statistics II (11)
368	29	-	R	Safety Engineering (26)
363	30	-	-	Programmable Calculator (16)
336	31	R	R	Computer Operations-Canned (15)
310	32	-	R	System Dynamics (34)
287	33	-	R	Experimental Design (35)

TABLE 14
THESIS USEFUL BY THESIS COMPLETED

Opinions	Yes	No	Total
Agree	48	1	49
No Opinion	7	24	31
Disagree	12	0	12
Total	67	25	92

Part III: Assignments/Promotion
Information

This area primarily concerned whether or not the graduates perceived they had been properly assigned upon their completion of their respective programs. Also of concern was whether or not they perceived that their follow-on assignments had utilized their knowledge gained through their graduate courses. The responses to questions 45 (initial assignment) and 46 (follow-on assignment) are shown in Tables 15 and 16, respectively.

Table 15 shows that of those that had an opinion, a large majority (72.3%) perceive that their advanced degree was considered in their initial assignment. However of the opinionated, 27.7 percent responded that it was not considered. There does not appear to be any direct correlation which can be drawn between the various year groups.

TABLE 15
INITIAL ASSIGNMENT CONSIDERED BY YEAR
OF GRADUATION (19XX)

	79	78	77	76&75	74&73	72-70	Total
Disagree	5	3	5	4	2	4	23
No Opinion	0	3	1	0	5	0	9
Agree	12	19	8	9	9	3	60

TABLE 16
FOLLOW-ON ASSIGNMENT CONSIDERED BY
YEAR OF GRADUATION (19XX)

	79	78	77	76&75	74&73	72-70	Total
Disagree	0	3	6	5	1	0	15
No Opinion	16	20	3	4	7	1	51
Agree	1	2	5	4	8	6	26

Table 16 shows that of those that had an opinion, a slight majority (63.4%) perceive that their advanced degree was considered in their follow-on assignments. A large number of the respondents did not have an opinion (55.4%). This seems reasonable when we consider that the bulk of the respondents have probably only had their present assignments since graduation.

Survey questions 47 through 50 concern the various promotional data of the respondents. Since promotion statistics were not one of the central thesis questions, it was decided to include the results and analysis to these questions in the appendix. For promotional data see Appendix C.

Part IV: Open-Ended Comments

Survey questions 51 through 54 were designed for the open comments of the respondents. The questions concerned present duty title (51), specific AFIT degree and source (52), comments on the use of certain concepts learned (53), and suggestions for improvement to the programs the graduates had completed (54).

The most significant number of respondents were presently being utilized at the standard base level civil engineering functions. The specific job titles provided by them, showed these graduates to be filling the entire spectrum of squadron level positions. The next highest number of graduates were in major command positions. The ninety-two respondents were being utilized throughout the worldwide USAF mission. There was not any inference which could be drawn between whether or not they had completed the FM program or CI program.

Question 52 served as a crosscheck to the respondent's answer to question 8. It also provided the names of several of the

civilian universities which the USAF had used for its graduate students. No single university appeared to be the one most frequently attended.

Question 53 proved to be very useful. The graduates were asked for their utilization of certain concepts on the job. Table 17 shows the number of respondents who wrote in comments for the specific areas shown.

TABLE 17
CONCEPTS UTILIZED

Area	No. of Respondents
Statistical Concepts:	
All Areas	2
Data	21
Probability	20
Distribution	11
Sampling Procedures	13
Regression Models	15
Bayesian Decision Making	0
Civil Engineering Design/Analysis Principles:	
Master Planning	15
Pavements	3
General Construction	9
Architecture	2
Landscaping	3
Water Systems	4
Bioenvironmental Systems	6
Electrical Systems	2
Fuels Systems	6
Fire Protection	3
Operations Research Concepts:	
Linear Programming	4
Dynamic Programming	0
Inventory Models	6
Queuing Models	8
Simulation	5
Network Analysis (PERT, CPM)	31
Decision Analysis	11

The range of comments for open-end question 54 spanned the entire spectrum of comments. One extreme had the highest praise for AFIT programs and the other extreme thought that their education was worthless. It was very evident when reading through these comments that some of the respondents spent a lot of time and thought on their answers. In fairness to those individuals the following comments are presented with the curriculum from which they graduated:

1. . . . the entire program was appropriate, adequate and quite useful. (FM)
2. . . . I purpose a shorter education period with special emphasis on management and less on technical areas. (CI)
3. . . . use graduates in areas where they can use their education. I enjoyed AFIT and was enthusiastic about my education. Now, 3 years later, having not been able to use 95% of the education, I'm very disappointed. (FM)
4. . . . the day to day problems in CE do not require the sophistication of the techniques offered in advanced degree programs. . . . if not necessary for promotion, I wouldn't have attended AFIT. (CI)
5. . . . allow the FM graduates to take School of Engineering electives. (FM)
6. . . . thanks for the continuing opportunity to be part of an excellent school. (FM)

7. . . . time to do it, lengthened 2 months. (FM)
8. . . . push for an Engineering Management program to replace the FM program and make it retroactive! (FM)
9. . . . make better use of graduates in areas of speciality. (CI)
10. . . . increase the number of slots in the FM program. The USAF needs to teach its engineers how to manage. (FM)
11. . . . thoroughly appreciated my opportunity to attend AFIT.
(FM)
12. . . . excellent for career enhancement. I prefer civilian institutions . . . good educational broadening and associations with our civilian peers. (CI)

In addition to these comments there were several comments recommending specific course additions and deletions. Courses which some respondents thought should have more emphasis included: Economic Analysis for Engineers, a course based on the Communication process, Management, and Writing. Courses which other respondents thought needed to be deleted included: Computer Programming, Financial Management, and Production Management.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

The primary objective of this research effort was to evaluate the advantage of a graduate degree in Facilities Management from AFIT versus similar programs in civilian institutions. The methodology of analysis consisted of the construction of five basic research questions. In order to determine the answer to these questions, a survey questionnaire was developed and sent to former graduates of these two programs. Chapter III presented a detailed analysis of the responses to the questionnaire. The following comments will restate the research questions and summarize the conclusions drawn from the respondents.

Question 1: Is there a need for graduate management education in the Air Force for civil engineers?

Overall 83.7 percent of the respondents agree that the degree is useful. No apparent trends or biases were noted with the exception of those who had experience in civil engineering service. Within this category, 97.1 percent of those who had more than ten years experience and 75.9 percent of those who had less than ten years experience thought that their degree had been useful. This speaks well for

the adage of "older and wiser." The more experienced probably appreciate their graduate education more than the less experienced.

On the other hand, when asked if their job needed the advanced degree which they held, 45.7 percent said "yes" and 40.2 percent said "no." These two percentages are too close to make a pronounced conclusive statement.

When asked if their present job had an AADC (Advanced Academic's Degree Code), of those that knew, 57.7 percent said "yes" and 42.3 percent said "no." A large number did not know (21.1%). Assuming that the respondents answered this question knowledgeably, it appears that a large number are either malassigned or presently filling jobs which need an AADC.

When asked if they thought their degree was considered in their initial assignment, of those who had an opinion, 72.3 percent said "yes" and 27.7 percent said "no." For the same question concerning follow-on assignments, 63.4 percent said "yes" and 36.6 percent said "no." These numbers appear fairly good on the surface, but the authors believe that there is room for improvement in this area. In order not to take these statistics out of context, the authors fully realize that this is a perception on the part of the respondents. This was the intent of those respective questions. We realize that MPC is required to make all initial assignments based on validated AADC positions. But it is apparent that 27.7 percent initially and

36.6 percent for follow-on assignments do not feel that their job needed the degree which was obtained.

In summary, there does appear to be a need for graduate management education in the Air Force for civil engineers since the majority of the graduates believe the programs to be useful. However, there does appear to be a need for further investigation into the area of AADC validation.

Question 2: Are the similar programs offered through civilian institutions providing equivalent education?

There were several approaches taken in order to answer this question. One approach was to determine if there was a discernible difference between the two groups of graduates and their level of assignment. Overall there was not a difference. Therefore, assuming that a better education leads to a higher level of responsibility, the CI programs are providing an equivalent education.

When the respondents were analyzed within each group and asked for their perception of the usefulness of their respective degrees, the CI graduates did respond more favorably than did the FM graduates. Of the CI graduates, 91.4 percent versus 78.9 percent of the FM graduates agreed that their graduate education was useful to them in the performance of their job. Therefore with this approach, the CI programs appear to be better than the FM program.

The third approach taken to analyze this question was to

determine the manner in which the graduates would rank their respective curriculums. The basic assumption for this approach is that if the graduate either agreed or disagreed as to the usefulness of a specific course, then he had taken the course and had a definitive perception of its usefulness. As previously shown, Kendall's Tau was very favorable; therefore, one master ranking was made of all the courses. Since Kendall's Tau was favorable, the CI graduate does appear to have had an equivalent education.

The final meaningful approach to this question was through the analysis of the open-end questions. Only two comments were received that favored the use of civilian institutions over the in-residence AFIT FM program. There were seven comments which reflected the USAF orientation of the FM program. These respondents thought this orientation provided the FM program the edge over CI programs.

In summary, the CI programs do appear to be providing an equivalent education in the context of the course content. But their single disadvantage is the absence of the USAF orientation.

Question 3: Are the courses offered in the AFIT Facilities Management Program current and relevant?

This question was answered through an analysis of the master course ranking list (Table 13, Chapter III). This list was developed based on the perceptive usefulness of specific courses by all graduate

students. Assuming that this list reflects the relevancy of the courses, an analysis of the current Facilities Management Program was made. Within the first 50 percentile of the master list (the first 17 courses), the current Facilities Management Program offers 82.4 percent of the courses when including both optional and required courses. If by inference it is assumed that Writing and Engineering Decision Making are integral parts of the Facilities Management Program content within other courses, then this percentage is increased to 94.1 percent. Within the first 75 percentile of the master list (the first 25 courses), the current Facilities Management Program offers 80 percent of the courses based on the previously stated inference. Assuming that the courses contained in the last 25 percentile (8 courses) of the master ranking list are reflective of the least useful courses, the current program offers 50 percent of the least useful courses.

The open-end questions also help to answer this question. Many of the prior graduates commented that they would like to see courses such as Energy and Environmental Analysis added to the curriculum as two separate courses. This specific improvement was accomplished for the 1979-80 school year.

In summary, the current Facilities Management Program does appear to be current and relevant according to the perceptions of the former graduates. However, the 75 percentile analysis and

the last 25 percentile analysis reflect a need for possible further improvements.

Question 4: Are the courses offered by civilian universities in Engineering Management or similar programs useful?

As previously stated in the response to question 2, the civilian university graduates perceive their degree to be more useful than do the Facilities Management Program graduates. But when a comparison was made of the civilian university curriculums with the master course ranking list, a different conclusion was drawn. Just as question 3 compared the Facilities Management Program and the master ranking list, the following is a similar comparison of the civilian university curriculums.

Within the first 50 percentile of the master list (the first 17 courses) the civilian university programs offer 70.6 percent of the courses which includes both optional and required courses. Within the first 75 percentile (the first 25 courses), the civilian university programs offer 76 percent of the courses. The main cause of the lower percentages for the civilian university programs is due to the USAF orientation of several of the courses within the 75th percentile. The main courses which are uniquely USAF oriented include C.E. Contracting, General Logistics, and Leadership Theory. Of the numerous civilian university catalogs reviewed, these courses were not part of their programs.

In summary, the civilian university programs are useful. However, their most singular disadvantage lies in their non-USAF orientation.

Question 5: Does the Facilities Management Program need to be changed to meet the demand of today's civil engineering manager?

In one word, yes. Throughout this effort, the analysis has shown that the present Facilities Management Program is needed and useful, but it has also shown the need for improvements to the existing program. The recommendations for these changes are included in the following section.

Recommendations

1. The Facilities Management Program should be reviewed for course content. Of the 33 courses reviewed by the respondents, the majority of the courses are available in the program. However, there are some courses such as Speech and Leadership Theory that should be added to the curriculum. Additionally, four required courses were in the lower 25 percent of the ranking. Of these four courses, Management and Production Management should be deleted from the curriculum and Statistics II should be reviewed to determine if it can also be deleted.

2. From the comments received and the rankings of the courses, the perceived needs of the graduates are toward management

and people-oriented courses and therefore the curriculum should stress courses in these areas. However, it also cannot be forgotten that graduates are managers in civil engineering and therefore require management courses oriented toward civil engineering needs.

3. When additional civil engineers are required for graduate management programs, the potential graduates should be sent to the Facilities Management Program before civilian university programs are considered because the Facilities Management Program is oriented to the Air Force needs.

4. The graduates of both programs should be assigned to jobs that require their graduate education.

5. Since many of the higher ranking officers in civil engineering consider the Facilities Management Program to be very applicable to the Air Force civil engineering needs, the program should receive extensive publicity throughout the Air Force and graduates should be considered very beneficial and highly promotable to the Air Force.

Recommendations for Future Research

The following recommendations are made for future research:

1. Survey all graduates of master degree programs who are in civil engineering to determine the usefulness of their particular

degree. This research should include the reasoning behind their acquiring a master's degree.

2. In order to improve the direct application of the courses in the Facilities Management Program, the graduates of both programs should be surveyed to determine the specific use of the knowledge that they have received.

APPENDIX A

SURVEY QUESTIONNAIRE

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



REPLY TO: LSG (Maj Johns/Capt Ray/AV 785-4437) 1 February 1980
ATTN OF:

SUBJECT: Survey Comparing the Usefulness of AFIT Sponsored
Management Graduate Programs

TO: AFIT Alumnus

1. The AFIT School of Systems and Logistics is constantly striving to make the graduate management curriculum relevant to the on-the-job needs of the Air Force. The attached questionnaire is intended to determine how graduates feel about the usefulness of the resident Facilities Management Program and the similar AFIT-sponsored management programs from civilian universities. The survey has been reviewed and approved by HQ USAF and has been designated USAF SCN 80-43.

2. While your participation in this survey is voluntary, a valid study cannot be conducted without your help. Your cooperation in providing the information will be appreciated and will be beneficial in evaluating the educational needs of civil engineering managers. Your responses to the questions will be confidential.

3. Please return the completed survey in the enclosed preaddressed envelope within one week of receipt.

LEWIS M. ISRAELITT, Colonel, USAF
Dean
School of Systems and Logistics

- 3 Atch
1. Survey
2. Answer Sheet
3. Return Envelope

PRIVACY ACT STATEMENT

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

a. Authority

(1) 10 USC 8012, Secretary of the Air Force, Powers, Duties, Delegation by Compensation; and/or

(2) 5 USC 301, Departmental Regulations; and/or

(3) DOD Instruction 1100.13, 17 Apr 68, Surveys of Department of Defense Personnel; and/or

(4) AFR 30-23, 22 Sep 76, Air Force Personnel Survey Programs.

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 and management related problems. Results of the research, based on the data provided, will be included in a written doctoral dissertation and/or master's thesis, and may also be included in published articles, reports, or texts. Distribution of the results of the research based on the survey data, whether in written form or 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 part or all of this survey.

1980 GRADUATE SURVEY

AFIT GRADUATE FACILITIES MANAGEMENT
PROGRAM AND SIMILAR CIVILIAN
UNIVERSITY GRADUATE DEGREES

Please mark your responses to the following questions on the machine scorable answer sheet with a Number 2 pencil.

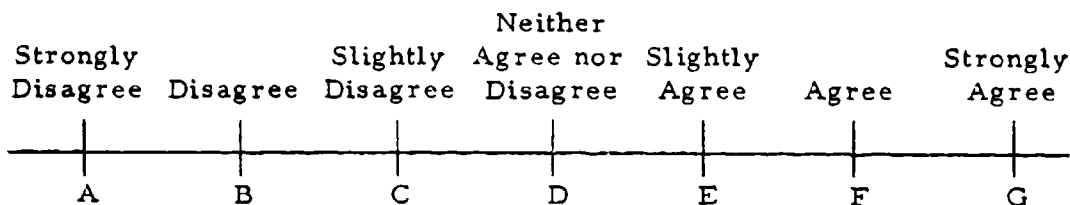
PART I--BACKGROUND INFORMATION

1. What is the organizational level of your current assignment?
 - a. Squadron or below
 - b. Group
 - c. Wing
 - d. Air Division
 - e. Numbered Air Force
 - f. Major Command
 - g. HQ Air Force
 - h. Department of Defense
 - i. Separate Operating Agency
 - j. Other (please describe) _____
 - k. Not applicable
2. What was your grade when you finished your AFIT master's degree program?
 - a. 0-1
 - b. 0-2
 - c. 0-3
 - d. 0-4
 - e. 0-5
 - f. 0-6
 - g. Civilian (please write in GS grade) _____
3. What is your current grade?
 - a. 0-1
 - b. 0-2
 - c. 0-3
 - d. 0-4
 - e. 0-5
 - f. 0-6
 - g. Civilian (please write in GS grade) _____

4. How many years of civil engineering service do you have?
 - a. 5 years or less
 - b. Over 5 years but less than 10
 - c. Over 10 years but less than 15
 - d. Over 15 years but less than 20
 - e. Over 20 years
5. What is your aeronautical rating?
 - a. Pilot
 - b. Navigator
 - c. Non rated
6. Does your current duty assignment have an Advanced Academic Degree Code?
 - a. Yes
 - b. No
 - c. I do not know
 - d. Yes, but the code is different from the code I possess
7. When did you complete your full-time master's degree requirements through AFIT?
 - a. in 1979
 - b. in 1978
 - c. in 1977
 - d. in 1976, 1975
 - e. in 1974, 1973
 - f. in 1972 or prior to 1972
8. Did you attend the resident AFIT School of Systems and Logistics and obtain your degree in their Facilities Management Program?
 - a. Yes
 - b. No

PART II--EDUCATION USEFULNESS/JOB REQUIREMENTS INFORMATION

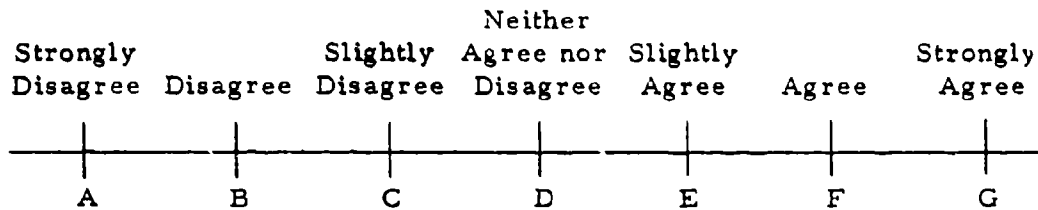
The questions in this section are concerned with the usefulness/appropriateness of your specific AFIT master's degree and the degree's relation to any job(s) that you have held since graduation. Read each statement carefully, then mark the answer sheet to indicate how much you agree or disagree with the statement. For questions 11, 12, and 13, if you answer either E, F, or G, then please comment in the last section (question #53) specifically which one or more of the areas you have utilized. For questions 9 through 47, use the following response scale:



9. My master's degree education is useful to my on-the-job performance.
10. My job requires an advanced education such as that provided through AFIT.

Preface each of the following statements with: Since graduation, performance of my job(s) has (have) been enhanced by . . .

11. . . . the conceptual understanding and/or application of one or more of the following statistical concepts:
 - Data (position, mean, median, mode, skewness, dispersion);
 - Probability (random variables, joint, marginal, conditional, variance, covariance);
 - Distributions (binomial, poisson, uniform, normal, exponential, t, F, Chi-Square);
 - Sampling procedures (independent, matched pairs);
 - Estimation and testing (nonparametric and parametric procedures, goodness of fit);
 - Regression models (simple linear, multiple, analysis of variance);
 - Bayesian decision making;
 - Other statistical concepts not contained above.



Preface each of the following statements with: Since graduation, performance of my job(s) has (have) been enhanced by . . .

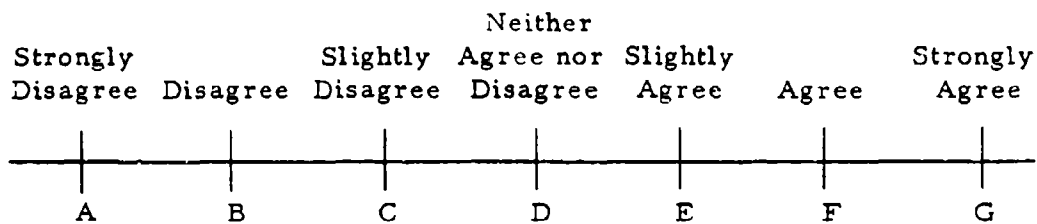
12. . . . an understanding of design/analysis principles in one or more of the following:

Master planning, pavements, general construction, architecture, landscaping, water systems, bioenvironmental systems, electrical systems, fuels systems, fire protection systems.

13. . . . a conceptual understanding and/or application of one or more of the following quantitative concepts:

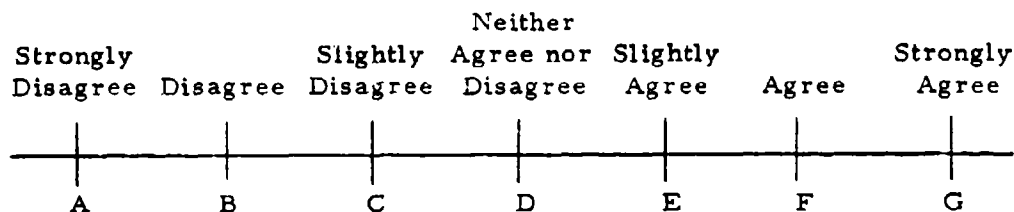
Linear programming (optimization, inequalities, simplex method, duality, sensitivity analysis);
 Dynamic programming (recursive optimization, state, stage);
 Inventory models (classic EOQ, shortages, lead time, order point);
 Queuing models (M/M/1, M/M/c, waiting lines and servers);
 Simulation (deterministic, Monte Carlo, estimation);
 Network analysis (PERT, CPM);
 Decision analysis (prior, posterior, preposition, decision trees, utility theory);
 Other mathematical techniques for aiding in managerial decision-making.

14. . . . the ability to understand how to write and run computer programs.
15. . . . the ability to run preprogrammed (canned) computer programs other than BEAMS.
16. . . . the use of a programmable, hand-held calculator.
17. . . . an understanding of the financial management methods and systems used by the DOD and/or the Air Force.



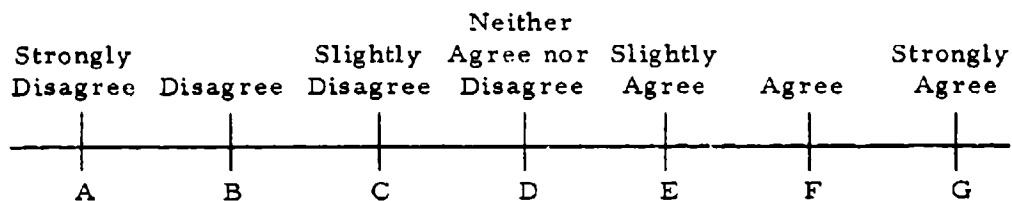
Preface each of the following statements with: Since graduation, performance of my job(s) has (have) been enhanced by . . .

18. . . . an understanding of societal economic concepts such as inflation, gross national product, balance of payments, the Federal Reserve, etc.
19. . . . a knowledge of research procedures and methods.
20. . . . the ability to understand and/or analyze existing organizational structures such as: MBO system, managerial planning and controlling, goal setting, implementation, and evaluation.
21. . . . the ability to understand and/or analyze organizational climate in the specific areas of individual behavior and human relations (understanding people, influencing and motivating performance, improving morale and discipline, and self-appraisal and analysis).
22. . . . understanding the process of rational decision making with applications in the analysis and design of engineering systems including decision making under uncertainty and risk, and certainty.
23. . . . the ability to analyze and design systems, and design and evaluate processes for assuring the reliability, maintainability and availability of systems.
24. . . . a general conceptual knowledge of statistics.
25. . . . a general conceptual knowledge of quantitative decision-making methods.
26. . . . the use of safety engineering as it applies to job safety analysis, reduction of accident rates, protective equipment, standards, rules, regulations, and laws.



Preface each of the following statements with: Since graduation, performance of my job(s) has (have) been enhanced by . . .

27. . . . the use of labor relations management as it applies to labor union contracts, bargaining, civil service, grievance procedures, discharge, and discipline.
28. . . . the use of work system analysis and design, methods of increasing productivity; productive work, nonproductive elements, and system productivity; work simplification and motion economy; various theories and systems of work standards and measurement.
29. . . . the use of economic analysis such as life cycle costing that relates to problems of replacement, economic selections, engineering evaluation and problems of depreciation.
30. . . . understanding various leadership styles and specifically defining my leadership style.
31. . . . the research and writing involved in completing my master's degree thesis. (Mark D if not applicable)
32. . . . the ability to verbally inform, convince, and/or persuade individuals relative to ideas, decisions, and concepts.
33. . . . understanding the maintenance and production function in a systems framework including such items as product selection and design, process design, production planning, physical layout, quality control, scheduling, job design, and methods improvement.
34. . . . understanding the methodology for modeling the dynamics of complex social-economic systems including the use of these models to study organizational policies and design for higher order, multiple-loop, non linear feedback structures.

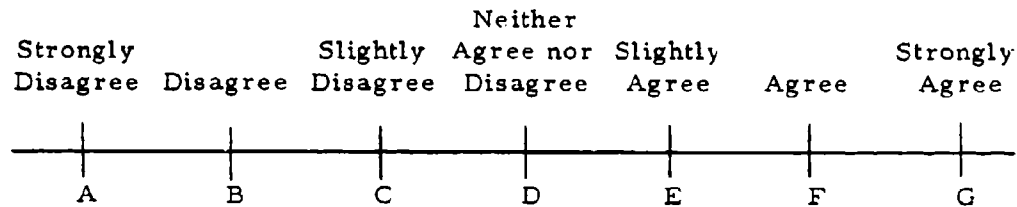


Preface each of the following statements with: Since graduation, performance of my job(s) has (have) been enhanced by . . .

35. . . . the knowledge of experimental design and analysis, including experimental designs, response surface analysis, evolutionary operations, multiple and partial regression and correlation.
36. . . . understanding types of energy, energy systems, and energy conservation measures.
37. . . . the use of the many facets of environmental planning.
38. . . . the use of accounting principles such as debits versus credits, income statements, etc.
39. . . . the ability to communicate through writing.
40. . . . understanding the major counseling approaches and the helping relationships in various settings.
41. . . . an understanding of the various technical, legal, and managerial principles in preparing and managing military service and construction project contracts.
42. . . . a general knowledge of logistics systems.
43. . . . the ability to skillfully obtain the needed information within my organization in order to set goals and control the decision-making process.
44. Did you complete a thesis for your AFIT graduate degree?
(As appropriate, mark only response A or B.)
 - a. Yes
 - b. No

PART III--ASSIGNMENT/PROMOTION INFORMATION

The questions in this section are intended to provide information about the assignments/promotability of Air Force Institute of Technology graduates. Please indicate how much you agree or disagree with questions #45, 46, and 47 using the following response scale:



45. My specific graduate education was considered in my initial assignment after graduation.
46. My specific graduate education was considered in other follow-on assignments.
47. My AFIT graduate education has enhanced my promotability.
48. I was selected for promotion in the secondary zone to the grade(s) of:
- a. Major
 - b. Lieutenant Colonel
 - c. Colonel
 - d. Major and Lieutenant Colonel
 - e. Major and Colonel
 - f. Lieutenant Colonel and Colonel
 - g. Major, Lieutenant Colonel and Colonel
 - h. Not selected for any secondary zone promotions when eligible
 - i. Have not been eligible for secondary zone consideration

49. I was selected for promotion in the primary zone the first time
I was eligible to the grade of:

- a. Major
- b. Lieutenant Colonel
- c. Colonel
- d. Major and Lieutenant Colonel
- e. Major and Colonel
- f. Lieutenant Colonel and Colonel
- g. Major, Lieutenant Colonel and Colonel
- h. Not applicable--I have not been eligible yet for primary zone consideration to any grade
- i. I have been passed over for promotion

50. I was passed over for promotion in the primary zone one or more times:

- a. To Major
- b. To Lieutenant Colonel
- c. To Major and Lieutenant Colonel
- d. Not applicable--I was selected for promotion when eligible

PART IV--OPEN-END QUESTIONS

Please indicate your responses in the area below each of the following questions:

51. What is your present duty title?
52. State the specific AFIT graduate degree which you obtained and the name of the school.
53. Please refer back to questions 11, 12, and 13. If you answered any of them either E, F, or G, indicate below the specific area you have used since receiving your master's degree.
54. If you have any suggestions for improvement of the AFIT graduate education program, please use the space below and on the reverse for your comments.

THANK YOU FOR YOUR COOPERATION IN COMPLETING THIS QUESTIONNAIRE. PLEASE ENCLOSE THE QUESTIONNAIRE AND THE MACHINE SCORABLE ANSWER SHEET IN THE RETURN ENVELOPE AND PLACE THE ENVELOPE IN OUTGOING OFFICIAL DISTRIBUTION.

APPENDIX P

PARAMETRIC ANALYSIS OF COURSES

TABLE 18
COURSE RANK BY MEANS FOR FACILITIES
MANAGEMENT GRADUATES

<u>Rank</u>	<u>Means</u>	<u>Median</u>	<u>Std Dev</u>	<u>Name of Course (Question Number)</u>
1	6.474	6.636	0.734	Writing (39)
2	6.140	6.306	0.915	Speech (32)
3	5.842	6.053	1.192	Organizational Behavior (21)
4	5.772	6.023	1.363	Financial Management (17)
5	5.702	5.925	1.267	Organizational Management (20)
6	5.456	5.714	1.364	Economics for C.E.'s (29)
7/8	5.421	5.647	1.414	C.E. Contracting (41)
7/8	5.421	5.737	1.475	Leadership Theory (30)
9/10	5.368	5.391	1.175	Counseling (40)
9/10	5.368	5.474	1.345	Management Information Sys (43)
11	5.351	5.675	1.458	Energy (36)
12	5.316	5.659	1.429	Environmental Analysis (37)
13	5.263	5.579	1.482	Operations Research I (25)
14	5.246	5.464	1.392	Engineering Decision Making (22)
15	5.105	5.571	1.622	Statistics I (24)
16	5.053	5.190	1.529	General Logistics (42)
17	5.035	5.250	1.439	Thesis (31)
18	4.860	5.107	1.517	Research Method (19)
19	4.807	5.333	1.894	Labor Relations Management (27)
20	4.737	5.526	1.876	Civil Engineering--General (12)
21	4.544	4.846	1.648	Macroeconomics (18)
22	4.526	4.941	1.824	Operations Research II (13)
23	4.368	4.667	1.779	Computer Programming-Writing (14)
24	4.368	4.353	1.484	Reliability Engineering (23)
25	4.351	4.545	1.727	Work Measurement (28)
26	4.298	4.692	1.870	Statistics II (11)
27	4.246	4.450	1.745	Programmable Calculator (16)
28	4.175	4.263	1.403	Safety Engineering (26)
29	4.158	4.179	1.820	Management and Production Mgt (33)
30	4.088	4.526	1.661	Accounting (38)
31	3.702	3.667	1.721	Computer Operations-Canned (15)
32	3.509	3.737	1.627	System Dynamics (34)
33	3.281	3.333	1.590	Experimental Design (35)

TABLE 19

COURSE RANK BY MEANS FOR GRADUATES
OF CIVILIAN UNIVERSITIES

<u>Rank</u>	<u>Means</u>	<u>Median</u>	<u>Std Dev</u>	<u>Name of Course (Question Number)</u>
1	6.257	6.528	1.172	Organizational Behavior (21)
2	6.029	6.292	1.248	Writing (39)
3	5.886	6.036	1.183	Speech (32)
4	5.771	6.067	1.477	Organizational Management (20)
5	5.714	6.036	1.426	Leadership Theory (30)
6	5.457	5.821	1.502	Management Information Sys (43)
7	5.286	5.679	1.506	Engineering Decision Making (22)
8	5.143	5.542	1.734	Counseling (40)
9/10	4.743	5.154	1.704	Economics for C.E.'s (29)
9/10	4.743	5.133	1.738	Statistics I (24)
11	4.571	5.050	1.836	Operations Research I (25)
12	4.514	4.778	1.788	Work Measurement (28)
13	4.429	5.050	1.975	Operations Research II (13)
14	4.371	4.571	1.832	Mgt and Production Mgt (33)
15	4.343	4.600	1.862	Financial Management (17)
16	4.314	4.714	1.937	Labor Relations Management (27)
17	4.286	4.429	1.872	Accounting (38)
18	4.257	4.556	1.853	Macroeconomics (18)
19/20	4.143	4.063	1.061	Thesis (31)
19/20	4.143	4.375	1.865	Research Method (19)
21	4.114	4.563	2.011	Reliability Engineering (23)
22	4.057	4.375	1.924	Computer Programming-Writing (4)
23	4.029	4.438	1.723	General Logistics (42)
24	3.857	4.000	1.881	Civil Engineering-General (12)
25	3.829	4.000	1.917	Energy (36)
26	3.800	4.250	2.026	Statistics II (11)
27	3.771	4.333	1.987	C. E. Contracting (41)
28/29	3.714	4.143	1.903	Environmental Analysis (37)
28/29	3.714	4.250	1.964	Safety Engineering (26)
30	3.571	3.333	1.929	Computer Operations-Canned (15)
31	3.457	3.125	1.990	Programmable Calculator (16)
32	3.143	3.000	1.817	System Dynamics (34)
33	2.857	2.750	1.665	Experimental Design (35)

APPENDIX C

PROMOTIONAL DATA

When the authors were determining the content of the questionnaire it was decided that promotion data concerning graduates of both programs would be interesting to analyze and possibly useful in evaluating the two programs to determine any differences. Therefore, the following analysis is made concerning promotion potential for graduates of these two programs.

First, it was determined if the respondents perceived that their promotion potential had been improved by attending either of these two programs. Of the 92 respondents, 82.6 percent perceived that their promotion potential had been improved.

TABLE 20
PROMOTION POTENTIAL

Opinions	FM	CI	Total
Agree	46	30	76
No Opinion	4	4	8
Disagree	7	1	8

Next, the primary zone promotion data was analyzed for the two groups. Of the 92 respondents, 58.7 percent had not been eligible, 30.4 percent had been promoted, and 10.9 percent had been passed over.

TABLE 21
PRIMARY ZONE PROMOTIONS

Opinions	FM	CI	Total
Promoted	14	14	28
Not Applicable	36	18	54
Passed Over	7	3	10

Then, the secondary zone promotion data was analyzed for each group. Seven of the 92 respondents had been promoted below the primary zone in at least one grade. Of the seven promoted below the zone, six officers have been graduates of civilian universities.

TABLE 22
SECONDARY ZONE PROMOTIONS

Opinions	FM	CI	Total
Promoted	1	6	7
Not Selected	29	17	46
Not Eligible	26	11	37
No Opinion	1	1	2

There have been 10 passovers for promotion out of the 92 respondents. One person from the Facilities Management Program had been passed over for promotion to major. Six people from the Facilities Management Program had been passed over to the grade of lieutenant colonel and three from civilian university programs.

Finally, an analysis concerning promotions and aeronautical rating was conducted. Of the 92 respondents, 21 people were rated. There were no passovers encountered in the rated group. In the secondary zone promotions two of the seven selected for promotion below the zone were rated.

The analysis for promotions is considered to be limited because many of the people that graduated during the period that was selected for analysis are no longer in the Air Force. Since these people are no longer in the Air Force, their reasons for getting out are not known and therefore complete promotional data for promotions and passovers is not available.

APPENDIX D

SAMPLE COMPUTER PROGRAMS AND DATA USED IN THE ANALYSIS

SAMPLE CROSSTABS PROGRAM

0025NHS.J :.3.16:1.16
00504:IDENT:WF1136.AFIT/LSUG. JOHNS / RAY. RAY/ JOHNS
00754:SELECT:SPSS/SPSS
0100RUN NAME:QUESTIONNAIRE ANALYSIS "F K VS C I"
0125VARIABLE LIST:VAR001 TO VAR050
0150INPUT FORMAT:FIXED(50(A1))
0175N OF CASES:92
0200INPUT MEDIUM:CARD
0225RECODE:VAR001 (A=1)(B=2)(C=3)(D=4)(E=5)(F=6)(G=7)
0250(H=8)(I=9)(J=10)(K=11)(N=0)
0275RECODE:VAR004 (A=1)(B=2)(C=3)(D=4)(E=5)(H=6)
0300RECODE:VAR006 (A=1)(B=2)(C=3)(D=4)(N=0)
0325RECODE:VAR007 (A=1)(B=2)(C=3)(D=4)(E=5)(F=6)(N=0)
0350RECODE:VAR008 (A=1)(B=2)
0375RECODE:VAR009,VAR010,VAR045 TO VAR047 (A=1)(B=2)(C=3)(D=4)(E=5)(F=6)(N=2)
0400(F=7)(G=3)
0425RECODE:VAR048 (A=1)(B=2)(C=3)(D=4)(E=5)(F=6)(G=1)(H=2)(I=3)(N=4)
0450RECODE:VAR049 (A=1)(B=2)(C=3)(D=4)(E=5)(F=6)(G=1)(H=2)(N=2)(I=3)
0475RECODE:VAR050 (A=1)(B=2)(C=3)(D=4)(N=4)
0500CROSSTABS:TABLES=VAR008 BY VAR006
0525READ INPUT DATA
05504:SELECTA:PMR100
0575CROSSTABS:TABLES=VAR045 BY VAR007
0600CROSSTABS:TABLES=VAR046 BY VAR007
0625CROSSTABS:TABLES=VAR008 BY VAR001
0650CROSSTABS:TABLES=VAR009 BY VAR001
0675CROSSTABS:TABLES=VAR009 BY VAR004
0700CROSSTABS:TABLES=VAR009 BY VAR007
0725CROSSTABS:TABLES=VAR009 BY VAR050
0750CROSSTABS:TABLES=VAR010 BY VAR001
0775CROSSTABS:TABLES=VAR010 BY VAR004
0800CROSSTABS:TABLES=VAR010 BY VAR007
0825CROSSTABS:TABLES=VAR010 BY VAR050
0850CROSSTABS:TABLES=VAR008 BY VAR047
0875CROSSTABS:TABLES=VAR008 BY VAR048
0900CROSSTABS:TABLES=VAR008 BY VAR049
0925CROSSTABS:TABLES=VAR008 BY VAR050
0950FINISH
0975ENDJOB

THIS PROGRAM WAS
FROM COPY 1 OF THE ORIGINAL

KENDALL'S TAU PROGRAM

```

0025#NS.J :.8.16:1.16
0050#:IDENT:WP1186.AFIT/LSOG.JOHNS/RAY, RAY/JOHNS
0075#:SELECT:SPSS/SPSS
0100RUN NAME: KENDALL TAU
0125VARIABLE LIST: FM.CI
0150INPUT FORMAT:FREEFIELD
0175N OF CASES: 33
0200INPUT MEDIUM: CARD
0225NONPAR CORR: FM.CI
0250OPTIONS: 5
0275READ INPUT DATA
0300#:SELECTA:PMR112
0325FINISH
0350#:ENDJOB

```

GENERAL STATISTICS PROGRAM

```

0025#NS.J :.8.16:1.16
0050#:IDENT:WP1186.AFIT/LSOG. JOHNS / RAY, RAY/ JOHNS
0075#:SELECT:SPSS/SPSS
0100RUN NAME:QUESTIONNAIRE ANALYSIS "F M VS C I"
0125VARIABLE LIST:VAR001 TO VAR050
0150INPUT FORMAT:FIXED(50(A1))
0175N OF CASES:72
0200INPUT MEDIUM: CARD
0225RECODE:VAR009 TO VAR010 ('A','B','C'=1)('D','N'=2)('E','F','G'=3)
0250RECODE:VAR008 ('A'=1)('B'=2)
0275RECODE:VAR011 TO VAR043 ('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)('F'=6)
0300:('G'=7)('N'=0)
0325CROSSTABS:TABLES=VAR008 BY VAR009
0350READ INPUT DATA
0375#:SELECTA:PMR100
0400CROSSTABS:TABLES=VAR008 BY VAR010
0425*SELECT IF:(VAR008 EQ 1)
0450FREQUENCIES:GENERAL=VAR011 TO VAR043
0475OPTIONS:5
0500STATISTICS:ALL
0525*SELECT IF:(VAR008 EQ 2)
0550FREQUENCIES:GENERAL=VAR011 TO VAR043
0575OPTIONS:5
0600STATISTICS:ALL
0625FINISH

```

[illegible]

DATA FILE CONTINUED

051ACCRCAKASEFCFEFFURFFGGFGEGDGGGEGCGGDDGGEGGGGFAAGGGMH
052FBDCCBFHGFEEFFEDDDDEGGCECEDDCGGEODCCGEDFFEEFAFGGHAU
053ACCRCKRREYRFBYBRDDGFFRUCGGBBGBGDFBGBCKREREREBBVBVILN
054ACDACAACAFDDEFBREFDDEEEEDFFDFDFDDEBRYRERGFFEEAFDEHAD
055ICCKRCAAFEDDGRBAEDCDFFERAEADDEEDDEECBFFBBDAGUEIHO
056IARACACAEFEEDFEEDDEEDDEEDDEEDDEEDDEEDDEEDDEEDDEEDDEED
057ADDDCKRUCEREBRBAECCECECECEDCDDFCRHAAEEAABDFFBAAIR
058FCCCCACAFDEGGGGGGFGGGGDFGRARGFEACRGGGEGEGAGDDEHND
059ACCAABAARFRRFRBFRFFRFFRFFRFFRFFRFFRFFRFFRFFRFFRFFRFFR
060ICCAAAACAFFDIEGDFFGGFFFGFGGFGEGGEGGGGGEFFGEGGGAFABHND
061FDEECAEAEDDDDEEDDEEDDEEDDEEDDEEDDEEDDEEDDEEDDEEDDEED
062ACCRCAAKRCCDRECCCEFFFEEDDKEEFCFCECCCEEDDRDAEDFIHO
063BCCARFRYSAAEFDABCEBAFECBCDDEFAACDDFERBEPDEHND
064ICDCCCBARFDRBRBRBFFGGFGGGGDFCGEACACDCCGGEGAGBFHAD
065ACCACRBRFAAAFFAAAAFGEAKREDRAGDGAEEAAGFAEGRFDGIHO
066FCCCCADAGGGAGDDGFGGGGGGGGGGGGGGGGDFGGGDDGGGAAGHND
067ACCAACARFCEDDDFDCCFGFDFCFDCCFGGDDDEBGGGDDDEEGIHO
068FDDCCADARFCFFFCFDEDEDEFFDDECEFFCCDEEEFEDEESAGEGAND
069GCCRCAAACDDFEEEEGDCEEEDEFRRFFEFDFEGEFFFRCAEDDIHO
070ACCRCAAFEGGDDDEEFFDDGDEEFFEGFEDDGGDFDGGFDEAFBJHD
071ICDDCEAECEDEFERGGFFFEFFFEFFFEFFFEFFFEFFFEFFFEFFFEFF
072FCBCCBRCAEAADAAGAAAAAAAAAAAAAAGAAAAAFAGAAADAARDGHI
073FCBRCABACCAFECFCDCDECRBBACRBFAAAEFAGCCGCAENEIHO
074FCACBRARFBDFBGFREGGGFFDDEFGGEDDEFFCGGEFFAEIDGIHO
075GDEDCREBGFGDGEDAFGGGGAGGAAAFGDPAEFAAGDEAAFRBFHBD
076FCBRCACAFBRFFBDFDFGGEEFFDREEFFGENRFFRGEFFFAFFFIHO
077ADDBREAGFGGGCBEGCGGGGGGGGGGGGGGGGGGGGGGGGGGAGBHI
078ADDAACBACDQDFDEFFFGFFGGFFGGFFDDEFGDDCEFFFDGAFDIA
079FCCCCRCAFDDDFBRBRCGGFDCEFGFGFGFCDDEGGGGFCABACHND
080AIFECBRFEARFEBRABREFEERBRFDEGDECBASECFEFEFRAGECDD
081ACCECCAAKREBEFEFFFEFFFEFFFEFFDDEFFDCEFFDFFFEFFFAEDFIHO
082FCDDCBDAFRFFEFEEGFFGGGEGGEFDFEGDDFFFGGEGFGAGDFHIA
083ACCBACACBFBEFFFEFEFFFEFFFEFFFEFFFEFFFEFFFEFFFEFFFEFF
084ACECDCAEFCEFRFFDGBRGGBBEDDFCFGBGADDDFRFGGEFAEFHND
085GDDCECEFEFRFFDFDFFFFDFRREERODDBBFRBFRBDDCHAB
086ACCRBRARFERFEAAEECFFEFFDEFDGGGGESDDEFFFEFAFDIHN
087ACCRCAARAFKGAECGFDEDDCBDFAEKEDAAAGFEFFGDAGDFIHN
088EEFECNEBGFCEBRBFCEFEEECEFEFFDFCECCFCFFFEENNNNNN
089ACCAANABFDEDBRGDEEGGFEFFFGGFEFFFAARDCCGFYFRGDDIHO
090FCCBACACBRKCDERKGFDEDDBDCCAADDFCCFCRAFEESADDFIHN
091GCCBCCAAEDRKRBRFEFEFFDEEEEDDEFEEDDEDEFEFEFEFEFHND
092ACCAAAAAAABGDDCFDDEEDDEEDDEFEFEBAEFBGEFDFAFNDHND

DATA FILE OF FM & CI SUM FOR
KENDALL'S TAU CALCULATION

0025	245	133	270	135	258	155	249	142	211	125
0050	242	121	329	152	259	149	277	145	325	202
0075	333	219	299	185	249	144	291	166	300	160
0100	238	130	274	151	248	158	311	166	309	200
0125	287	145	350	206	237	153	200	110	187	100
0150	305	134	393	130	233	150	369	211	306	180
0175	309	132	288	141	306	191				

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