ABSTRACT

THE UTILIZATION OF ENGINEERS IN AN INDUSTRIAL ORGANIZATION

A SOCIAL-PSYCHOLOGICAL ANALYSIS OF THE DISCONTENT OF A PROFESSION

by Thomas Anthony Natiello

This thesis inquires into the motivation and meaning of the statement of certain engineers that they would prefer to do more work. This statement is used as a measure of the engineers' perceptions of their utilization.

A large manufacturer of electronic equipment took a sample of 800 engineers from six laboratories located in different sections of the United States. The organization's personnel research group administered a questionnaire which asked the engineers' opinions on the amount of work they are expected to do. Depending on occupational level, between 20 and 43 per cent of the engineers said that they preferred to do more work.

The desire for more work expressed by this relatively large percentage of engineers is significant if it is indicative either of a failure of management to utilize properly these engineers, or of the engineers' attempts to satisfy personal desires within their organizational roles.

The questionnaire also investigated other areas, such as the engineers' attitudes toward work, their perspectives toward the engineering organization, the importance of selected personal goals, their objectives in further education, and the degree to which particular types of coursework met the engineers' aims. The responses to these areas of inquiry were used in this study to characterize the engineer who preferred more work.

The method of analysis was to first divide the engineers' responses into two groups, those coming from engineers who preferred more work and those from engineers who felt they had the right amount of work. The "right amount of work" engineers were used as a benchmark from which differences between them and the "prefer

more" engineers could be measured. In order to hold constant as many personal and organizational variables as possible, a further division of responses was made according to the occupational level of the engineer, and differences were compared within each occupational level.

It was found that the engineers who prefer more work refer to the nature or content of their work, rather than to the quantity of the work they are asked to perform. They are dissatisfied with their present level of work and desire higher level technical work. Further, the "prefer more" engineers are not pleased with their advancement in the organization.

The highest percentages of "prefer more" engineers are found at occupational levels composed of young engineers or of engineers who are at critical points in their mobility patterns. However, at least one out of five engineers at every occupational level prefers to do more work.

This investigation revealed that the "prefer more" engineers attach greater importance to managerial or organizational goals than they do to technical goals.

It appears that the "prefer more" engineers are interested in higher level technical work primarily as a vehicle for advancement, rather than for the nature of the technical work.

It was further found that the "prefer more" engineers perceive the engineering organization as offering greater rewards to the managerial engineer than to the staff professional engineer, causing what interest the engineers may have in technical work to be submerged in their greater desire for advancement and rewards of the type found in a managerial position.

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By

Thomas Anthony Natiello

A THESIS

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The author expresses gratitude to the members of his thesis committee, Professor Dalton E. McFarland and Professor William H. Form, and especially to its chairman Professor W. Lloyd Warner for the help and assistance generously provided in the completion of this study.

Further thanks are also extended to the Basic Personnel Research Staff of the Corporation who provided the information that made this study possible. In particular, Dr. Richard R. Ritti was most helpful in providing data from his survey of development engineers, and suggesting the study of under-utilization as a problem.

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CHAPTER I

THE NATURE OF THE STUDY

The general purpose of this study and the research on which it is founded, is to contribute further understanding toward the use of engineering professionals in industry. Inquiry is made into the motivations behind engineers' feelings of utilization. This is needed both for the efficient utilization of engineers and for the development of aspects of organization theory pertaining to the administration of professional personnel.

Within the past few decades, expenditures by business and industry for research and development have increased at an accelerating pace, resulting in the employment of large numbers of engineers. Engineering, which once was an auxiliary function, has become a major function in many organizations.[1] If engineers are not utilized to their fullest extent, their improper utilization may account for large amounts of wasted resources.

According to the National Science Foundation, total expenditures for research and development have gone from $5.1 billion in 1953-54 to $16.4 billion in 1962-63.[2] Employment in professional and technical

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[1] For a discussion of the need for technical manpower see: Andrew A. Freeman, Brainpower Quest, The Macmillan Company, New York, 1958, and Samuel E. Hill and Frederick Harbison, Manpower and Innovation in American Industry, Industrial Relations Section, Princeton University, 1959.

[2] National Science Foundation, Reviews of Data on Research and Development, No. 41, "National Trends in R & D Funds, 1953-62," NSF 63-40, and U. S. President, Economic Report of the President, 1964.

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occupations showed the most rapid growth of all occupational groups, 66.5 per cent from 1950 to 1963.[3]

Between 1930 and 1960, while the civilian labor force increased by 42 per cent and professional and technical workers by 126 per cent, the number of engineers rose over 290 per cent.[4] In the period from 1954 to 1963, engineers increased by 300,000, or 46 per cent.

Another index of the striking growth of the engineering profession can be shown in the ratio of engineers to the number of workers in the civilian labor force. In 1930, there were 436 engineers for every 100,000 workers in the civilian labor force; and by 1950, there were 861 per 100,000 - nearly a twofold increase - and by 1963 the estimated ratio has tripled to 1,302 per 100,000 workers. From a different point of view, number of workers per engineer, the ratio has steadily decreased, although a little more slowly in recent years. This ratio dropped from 230 workers per engineer in 1930 to 77 in 1963.[5]

In light of the great amount of resources expended on engineering, it is imperative that research on the utilization of engineers be carried out in order that management will be better able to understand and more effectively use the professional engineer. It is for this reason that this dissertation inquires into the motivations behind engineers' feelings of utilization.

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[3]U. S. Department of Labor, Bureau of Labor Statistics, Labor Force, Employment, and Unemployment Statistics, 1947-1961.

[4]An engineer is defined in this study as a person engaging in work at a level which requires a knowledge of, or training in, engineering equivalent at least to that acquired through completion of a 4-year college course in engineering.

[5]U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, Vol. 10, No. 8, 1964; U. S. Department of Commerce, Bureau of the Census, U. S. Census of Population, 1960, General Social and Economic Characteristics, United States Summary, PC (1) - 1C; U. S. Department of Commerce, Bureau of the Census, Occupational Trends in the United States, 1900 to 1950; and National Science Foundation, Scientific and Technical Manpower Resources, Summary Information on Employment, Characteristics, Supply, and Training, NSF 6428.

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Studies Concerning the Utilization of Engineers

The research literature has for some time contained studies of engineers in which groups of engineers expressing feelings of inadequate utilization could be found.

Kornhauser states: "In study after study, scientists and engineers in industry indicate that they think their special competence is not adequately utilized."[6]

In a study of six major industrial companies, almost three-quarters of the engineers and scientists agreed that the "so-called shortage of scientists and engineers is caused largely by poor utilization of available talent by management."[7]

Two-fifths of a sample of scientists and engineers in government and industry felt that their job does not require so much training and ability as they have.[8]

The sources of job dissatisfaction most often mentioned by scientists and engineers in ten companies were: "poor utilization of abilities and skills," "unable to prove oneself," "lesser trained person could do job," and "boredom or monotony."[9]

Feelings of utilization have also been shown to differ between occupational levels of professional engineers. In one study, six per cent of non-supervisory engineers and scientists, but no supervisors, listed "having talents utilized and extended" as one of the greatest problems of young professionals.[10]

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[6]William Kornhauser, Scientists in Industry, Conflict and Accommodation, Berkeley at Los Angelos: University of California Press, 1963, p. 139.

[7]The Conflict Between the Management Mind and the Scientific Mind, Princeton: Opinion Research Corporation, 1959, pp.A-40, A-41.

[8]Summary Report of Survey of Attitudes of Scientists and Engineers in Government and Industry, Committee on Engineers and Scientists for Federal Government Programs, Washington: Government Printing Office, 1957, p. 14 and p. 57.

[9]Lee E. Danielson, Characteristics of Engineers and Scientists, Ann Arbor: Bureau of Industrial Relations, University of Michigan, 1960, p. 42.

[10]Lee E. Danielson, Ibid, p. 56

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Interest in utilization has also been shown by professional organizations. Some years ago the National Society of Professional Engineers introduced a yearly "contest" for the Industrial Professional Development Award. This is an award given to the company having the best climate for professional development. In analyzing the contest criteria, a relationship can be seen between having a good professional climate and utilizing engineers well.[11]

The studies cited earlier are, for the most part, descriptive, relating only that feelings of poor utilization do exist. A need is felt for a deeper investigation into the causes of different feelings engineers may have concerning their utilization. This dissertation is intended to help fill part of this need.

Organizational Theory Approaches Toward Professional Utilization

The utilization of engineers can be viewed from at least two points of view. One point of view may be called managerial and the other perceptual.

The managerial point of view of utilization takes the position that utilization of the engineer is in the hands of management. If management follows principles such as division of labor and using the lowest possible skill level to perform certain functions, then the managerial view holds that maximum utilization of individuals will take place. From this point of view, inefficient utilization of engineers is a fault of management and could be corrected by the proper use of management techniques.[12]

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[11] Engineer-in-Industry Subcommittee of the Employment Practices Committee, Criteria of Professional Employment of Engineers, National Society of Professional Engineers, 1964.

[12] Examples of the application of a managerial point of view toward the utilization of engineers in industry and government can be found in: Selected Papers on the Role of the Engineer-Scientist in America, a conference held at Michigan State University, April 25-26, 1958, Michigan State University, Labor and Industrial Relations Center, and Selected Papers on the Utilization of Engineering Personnel, a conference held at Michigan State University, February 19-20, 1960, Michigan State University, Labor and Industrial Relations Center.

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Following this thinking, if a certain percentage of engineers feel poorly utilized, they somehow are not being properly managed and could be put to better use. This point of view has weighty repercussions, as shortages of engineering talent, rather than being a result of demand exceeding supply, could be viewed as being contributed to by poor management of already held talent.[13] Indeed, the quotations above appear to lend support to this point of view.

However, noting the percentages of engineers, in the studies cited earlier, who feel poorly utilized, it is apparent that this feeling is not held by all engineers, but only certain proportions of them. Since only certain proportions of engineers feel poorly utilized, it is possible that these are mismanaged engineers. However, it is also possible that these engineers perceive themselves to be poorly utilized, while the remaining engineers do not. This presents the possibility of a second point of view on utilization, one which considers the engineer's perception of his utilization.

The perceptual point of view takes the position that an engineer's feeling of utilization is dependent on his perception of the work situation. In turn, his perception of the work situation is influenced by the goals and objectives he seeks to achieve in the work situation, his occupational position, and other information the engineer accumulates as he views his environment. For example, two engineers may perform duties with similar work content. One engineer, because of the influence of certain goals and objectives may feel poorly utilized, while the other engineer may feel properly utilized.

What each engineer sees about engineering in his organization is dependent on his goals and objectives, his occupational status in the organization, and the accumulation of experiences that have taken place prior to his response to this inquiry. The engineer's perceptions of the work situation are not only a matter of how he views his work but also are influenced by the occupational position the engineer occupies at the moment he responds to the stimulus of a given question.

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[13] For a discussion of the shortage of engineers, see: David M. Blank and George J. Stigler, The Demand and Supply of Scientific Personnel, New York: National Bureau of Economic Research, Inc., 1957, pp. 22-24, 32-33.

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An engineer's perception of a work situation, from this point of view, is dependent on the interaction of the individual's personality and the organizational setting in which he finds himself. Both the engineer's personality and the organizational setting are continually evolving, each being changed by the other and assuming new positions of dynamic equilibrium.

Obviously, sometimes engineers are not properly utilized simply because of bad management techniques, therefore it would be erroneous to completely dismiss the managerial or structural point of view entirely. However, to fully understand the engineer's feeling of utilization, it is also necessary to investigate his perceptions of the organizational environment in which he works.

This study will investigate the engineer's perception of the work situation to determine what differences exist in goals and attitudes between engineers who feel properly utilized and those who do not.

Direction of Research

Recently the Basic Personnel Research Staff of a large electronics manufacturer administered a questionnaire to a number of engineers in their corporation. From this sample, a smaller population of engineers was drawn and their responses to the questionnaire were examined by the author and form the basis of this study.

One of the questions in the questionnaire asks the engineers: "How do you feel about the amount of work you are expected to do?" The possible responses to this question were: "I would prefer to do more," about the right amount," and "too much."

"I would prefer to do more work" was the response of 20 to 43 per cent of the engineers, depending on their occupational level.

This response indicates that at every occupational level at least one of every five engineers prefers to do more than the amount of work he is expected to do, and therefore feels poorly utilized.

This question concerning the amount of work an engineer prefers to do is used in this study as a means of separating those engineers who feel properly utilized from those who do not and comparing the two.

Using this comparative technique, this study investigates what an engineer means when he says that he would prefer to do more work.

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Does he speak in terms of quantity or level of work? What is his motivation for doing so? Are engineers of particular age, occupational level, or education more apt to feel poorly utilized than others? What is the effect of feelings of utilization on objectives of further education, on personal mobility patterns, and the need to change existing paths of mobility?

Description of Sample of Engineers

The sample of engineers used in this study consists of eight hundred engineers taken from six of the Corporation's laboratories located in different sections of the United States. Chart 1, The Dual Ladder of Engineering Advancement, shows the number of engineers in the sample at each occupational level and the paths of advancement within the engineering organization of the Corporation.

The hierarchy of the engineering organization of the Corporation is set up in dual ladder form and operates in the following manner.

Normally a young engineer with no previous experience in industry would enter the engineering organization at level 1. Promotion to levels 2, 3, and staff level 4S are very much a function of length of service both in and out of the Corporation. It is the opinion of the Corporation's personnel research staff that there is very little merit involved in making these promotions and they are primarily a function of degree level and experience.

Promotion from level 3 to managerial level 4M is, however, based more strongly on merit. It is at engineering level 3 where the decision is made to promote the engineer to either a managerial or a staff position. Promotion to the managerial position 4M is based on merit and promotion to staff level 4S is based primarily on experience.

Once promoted to managerial level 4M, an engineer has the potential of being promoted to managerial level 6M and beyond. The opportunities for advancement beyond staff level 6S, however, are different from the opportunities for advancement beyond managerial level 6M. There are approximately six times as many persons at managerial level 6M as there are at staff level 6S. Part of the reason for this is that managerial level 6M is a senior managerial function and there is a need for a large number of these people to manage the various functions

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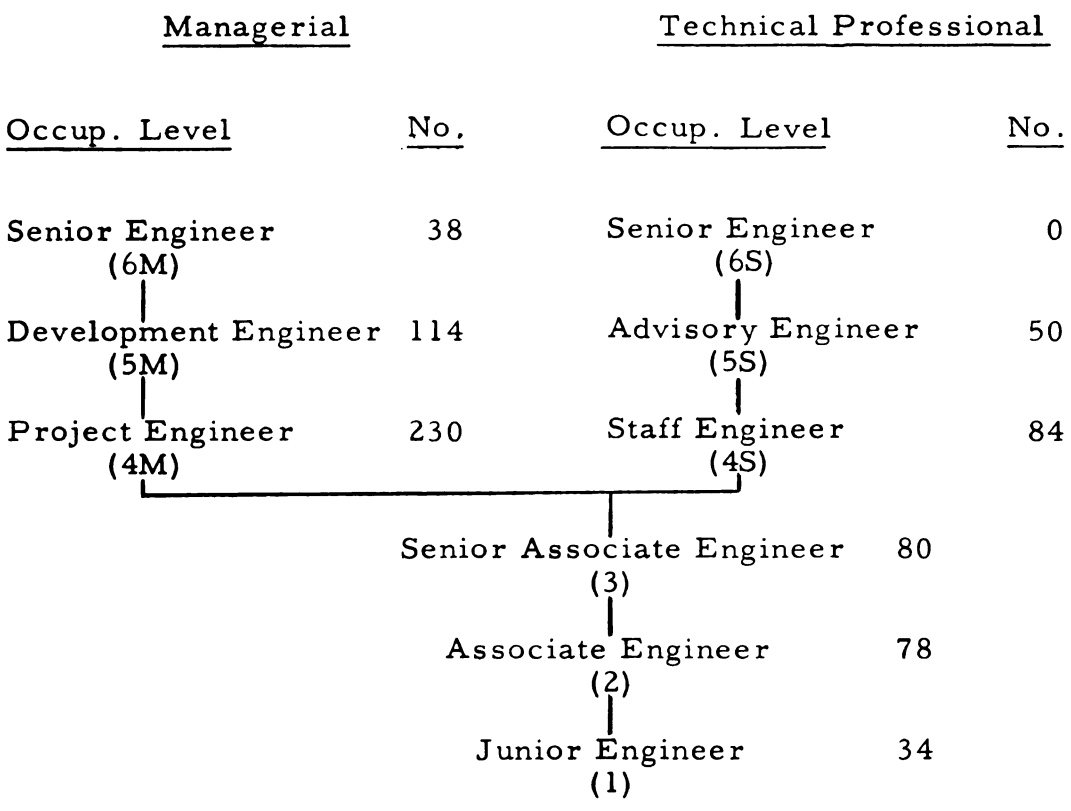

Chart 1.--The Dual Ladder of Engineering Advancement

within the development laboratory organization. The staff level position 6S is a senior staff technical position and there are only 50 of these people in the total organization. Opportunities for advancement beyond staff level 6S usually do not exist, and, for that matter, the opportunities for advancing from staff level 5S to staff level 6S are extremely poor. On the other hand, the opportunity to advance from managerial level 6M to a higher level is good.

Data were available for all occupational levels in the engineering organization, except for the senior engineer technical professional level 6S. This level, therefore, will not be considered in the following analysis. Since few engineers exist in the organization at this level, a significant number of these individuals could not be obtained to yield meaningful statistics.

The various occupational levels from this point on will be referred to by their number and letter designation only. The greater the number,

the higher the occupational level in the engineering organization. The letter "M" designates a managerial position and the letter "S" designates a staff technical professional position. The use of a number only for an occupational level indicates engineering levels before promotion to a staff or managerial position takes place.

The Research Instrument

The research instrument consists of the Corporation questionnaire. The questions used in this study are presented in Appendix A.

Analytical Methods and Techniques

The actual statistical computations of the responses gathered from the questionnaire were performed by the author using a Control Data Corporation 3600 digital computer at Michigan State University.

Use was made of a program for analysis of contingency tables. This program may be used to form bivariate frequency distributions from designated pairs of variables on magnetic tape.

The program performs any combination of the following operations on designated tables: row and/or column means and standard deviations; percentages of each cell on the associated row, column and/or table total; theoretical frequencies; cell contributions to table chi-square and degrees of freedom contingency coefficient; tau; gamma; product-movement correlation coefficient; and Krushal-Wallis H.

The standard program was modified by the author through recoding to allow three and four way breakdowns to be performed.

The author first divided the sample of engineers by occupational level. The occupational level categories of engineers were further subdivided according to their work preference response -- their feelings about the amount of work they are expected to do. Those engineers who preferred to do more work were examined for characteristics peculiar to themselves and compared with those engineers who feel they have the right amount of work, for the particular variables examined in this study.

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Organizational Framework of the Study

It was first hypothesized that the prefer more response is the characteristic of an engineer who believes he is not being technically utilized and desires higher level technical work. As the studies outlined earlier in this chapter demonstrate, groups of individuals feeling inadequate technical utilization have been detected in many other studies of engineers.

Indeed, the prefer more engineer's responses toward feeling poorly utilized at first appeared to substantiate this hypothesis. What was left to be done, however, was to determine what motivates the prefer more engineer, of all the engineers in the study, to feel so strongly that he is poorly utilized.

It was hypothesized that the prefer more engineer attached greater importance to scientific and technical accomplishments and therefore desired higher level technical work.

To test this hypothesis, a study was made of the importance attached to certain goals by the engineers. This is done in Chapter IV. It was hypothesized that the prefer more engineers would be found to stress technical and scientific goals when compared with the engineers who felt they had the right amount of work. By attaching more importance to technical goals, the prefer more engineers would tend to demand higher level technical work. In short, a case where technical work was desired as an end in itself. It was further hypothesized that if the prefer more engineers were given higher level technical work, work which would better utilize their technical abilities, they would tend to be more satisfied with the work situation.

The investigation of the prefer more engineer's goal structure, carried out in Chapter IV, indicated that the demand for higher level, more challenging technical work might not be the only motivation, nor the basic motivation, behind the engineer's prefer more response.

What the prefer more engineers appear to attach most importance to, and be most interested in, is work of a managerial nature. Concerning technical work, they appear to be more interested in directing it than performing it. It is felt that educational objectives are indicative of the future career objectives of the engineers. Therefore, to further substantiate the managerial interpretation that the

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prefer more response had taken on, an investigation was made into the prefer more engineers' objectives in further education. This is done in Chapter V. Here too it was found that the prefer more engineers place greater emphasis on additional education which prepares them for managerial duties.

If the prefer more engineers hold managerial goals to be of importance, and if they feel educational preparation of a managerial nature best meets their aims and objectives, why do they demonstrate greater feelings of poor technical utilization?

Two hypotheses may be proposed on this question. The first is that the prefer more engineers desire to become managers. However, in order to become managers, they must demonstrate their ability and prowess in technical matters. If they perform the same functions as the other engineers and work on what might be called "routine" technical work, it is difficult for them to distinguish themselves, hence they desire higher level technical work through which they can demonstrate their ability. In this case, the engineers would be primarily interested in mobility and seek every opportunity through which they could demonstrate their worth and be promoted to higher positions.

Another hypothesis is that the prefer more engineers seek higher level technical work and feel that only through assuming directive or managerial positions will they be able to get the higher level technical work which they desire.

The second hypothesis does not appear to be substantiated by the evidence at hand. Both the analyses of goal importance and educational objectives in Chapters IV and V indicate that the prefer more engineers appear to be less interested in performing technical work, than in directing it.

It is hypothesized that the prefer more category is made up of engineers who seek as rapid advancement as possible; and, because as they rise in the organization they come to perceive that a managerial position offers them the greater rewards and advancement, they tend to take on a managerial orientation. Because the prefer more engineers are interested in advancement, they may hold managerial goals as more important and more rewarding, even though they may desire higher level technical work.

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This conclusion is further substantiated by the findings of Chapters II, IV, and V describing changes that take place at different occupational levels in the engineers' perspectives, causing them to increasingly favor managerial positions.

In general, it is shown in Chapter II that, as higher occupational levels are viewed, a change in perspective favoring a managerial over a staff position does take place. At lower levels a staff position is viewed more favorably, whereas at higher levels a managerial position is viewed as more desirable by the majority of engineers at that level.

The following chapters examine in detail the above hypotheses. Chapter II examines the perceptions of the engineers at each occupational level toward their profession and the industrial enterprise in which they work. Engineers' opinions on comparing staff and managerial positions at the same occupational level and their attitudes toward the Dual Ladder of engineering advancement are examined.

In Chapter III the engineers who prefer to do more work are located in the engineering organization. The engineer who prefers more work is analyzed by considering the content of his work, his views on work, and what he means when he says he prefers more work.

Chapter IV considers the engineer's personal goals and objectives. This chapter presents what personal goals the engineer considers to be of most importance to him and compares the goals of the prefer more and the right amount of work engineers.

Chapter V examines the objectives in further education of the engineering population. It is an extension of the examination of the personal goals of the engineer in Chapter IV. In this case, however, the objectives an engineer may have in further education are taken as indications of his personal goals.

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CHAPTER II

THE ENGINEER'S PERCEPTION OF THE ENGINEERING ORGANIZATION

In order to examine what an engineer means when he states that he would prefer to do more work and his motivation for doing so, it is necessary to examine the engineer's perception of the engineering organization in which he is employed. It is also necessary to examine the possible mobility patterns that exist for the engineer in this organization.

The Engineering Organization

The Corporation's engineering organization is composed of a dual hierarchy. As was explained in an earlier section, staff and managerial engineers are separate at levels higher than the third engineering level.

When an engineer reaches level 3, senior associate level, two paths of mobility are possible -- promotion through the staff or through the managerial side of the organization's dual hierarchy.

The dual hierarchy was set up in an attempt to provide upward mobility for those technical personnel who had little interest in managerial or organizational affairs. These technical personnel were to be given as equal an opportunity to rise on the staff side as were their counterparts on the managerial side of the organization. While it has been shown that, in actuality, mobility on the staff side of the dual ladder is more limited than on the managerial side, the following section investigates how the engineer perceives the dual hierarchy as functioning.

The population of engineers was asked how they thought most technical people view a promotion from level 3, senior associate level, to level 4S, staff level, as compared with a promotion from level 3, senior associate, to level 4M, project level (managerial). The majority of both the prefer more and the right amount of work engineers

expressed the feeling, to a large degree, that a promotion to project level (managerial) is usually viewed as a bigger promotion than one to staff level. This was true for all occupational levels. (See Table 1, Appendix B) The range of percentages of engineers feeling this to be true went from a low of 47% at engineering level 1 to a high of 94% at managerial level 5M for the right amount engineers. For the prefer more engineers, percentages ranged from a low 63% at level 2 to a high of 100% at staff level 5S.

Viewing a promotion to a managerial position as bigger than a staff promotion is more pronounced among the prefer more work engineers. At almost every occupational level, a higher percentage of prefer more than right amount of work engineers feel this way. Note that at staff level 5S every engineer in the prefer more category viewed a promotion to a managerial position as being bigger.

Within this organization, equivalent level staff and managerial positions are clearly not equally desirable to the engineers making up the organization. For those who prefer more work, staff positions are particularly undesirable in comparison with the managerial positions.

What has been discussed is a measure of the engineer's perception of the prevailing attitudes in the organization toward managerial and staff positions. Consider now how the engineer himself feels about being either a manager or a staff professional.

The population was asked: "While you may already have been promoted to either a managerial position or a staff professional position, if you had your choice,would you rather be a manager of a group or a staff professional at a similar level (e.g. be a project level manager or a staff level professional)?"

The percentage of those engineers who feel they would rather be a manager increases with higher occupational levels. Considering only those engineers who feel they have the right amount of work, the percentage of engineers who would rather be manager of a group runs from 30% at level 1 to 53% at engineering level 3. The percentage drops and remains constant at staff levels 4S and 5S. However, it is 71% at managerial level 4M and reaches a high of 86% at managerial level 6M. (See Table 2, Appendix B)

The opposite situation exists for those engineers who would rather

be staff professionals. The percentage of these engineers decreases as higher occupational levels are considered. Only at staff levels 4S and 5S and engineering level 1, do the majority of engineers who have the right amount of work feel they would rather be staff professionals.

In a question such as this, Leon Festinger's theory of "cognitive dissonance" might be supposed to have a great influence on the response.[1] Briefly, the theory states that when a person holds two incompatible ideas at the same time (cognitions), such as being a staff engineer and wanting to be a manager, dissonance occurs. This causes unpleasant internal tensions which the individual tries to reduce by reducing the dissonance. This can be done by changing one idea (cognition) or the other to make them less incompatible. For example, the staff engineer may give up wanting to be a manager and say he would rather be a staff engineer. Therefore it is possible that being a staff member presupposes a lower preference toward being a manager than toward the staff position now occupied. Similarly, the high response from managers preferring to be managers might be said to be caused by the fact that they are already managers.

When this question was asked at the 4S and 5S staff levels, note the differences between the prefer more and the right amount of work engineers in the percentages of those who would rather be managers. At level 5S, there is a 26% statistically significant difference between the response of 57% of the prefer more and 31% of the right amount engineers who would rather be managers. A similar, but slightly lower difference exists at the 4S level.

The engineers who prefer more work at each occupational level display a greater tendency to feel that they would rather be managers, even those who are already staff engineers.

Before developing further the question of just what the prefer more work response refers to and what motivates this response, the following sections will investigate why a managerial position is

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[1] Leon Festinger, A Theory of Cognitive Dissonance, Evanston, Ill.: Row, Peterson, 1957, and Conflict, Decision and Dissonance, Stanford, California: Stanford University Press, 1964.

considered by an engineer to be more, or less, desirable than a staff position.

Comparison of Equivalent Level Managerial and Staff Professional Positions

Method of Analysis

Engineers at each occupational level were asked to rate what they felt were the differences between equivalent staff and managerial positions on thirteen job factors. (See Tables 3-15, Appendix B) The rating scale ranged from 1 to 5, 1 meaning that a managerial job had much more, and 5 meaning that a staff position had much more of the factor involved. Two through 4 are gradiations in between, with 3 rating both managerial and staff positions about the same. For purposes of this analysis, the 1 and 2 responses and the 4 and 5 responses are grouped together. One and 2 yield a category where the managerial position has more of a factor to some degree and 4 and 5 yield a category where the staff professional position has more of the factor to some degree.

The factors used as a basis of comparison were: interesting work, utilization of skills, having contributions recognized, salary, effort required, chance to make important technical decisions, prestige, opportunity to follow own interests, ability required, potential for getting action on ideas, excitement, potential for advancement, and power to initiate programs.

The responses to these questions differed at the various occupational levels. There is no clearcut direction of feeling within the groups, but rather diverse responses that, nevertheless, yield interesting perspectives upon analysis. The procedure followed was to summarize briefly the findings of the engineers' opinions for each job factor by occupational level, followed by a discussion and analysis of the findings.

The analysis will deal primarily with: what attitude toward a particular job is most probable at a particular occupational level, how the responses of the engineer who prefers more work differ from the responses of the engineer who has the right amount of work, and where transitions in the engineer's perspective toward particular jobs take

place in the occupational level structure.

Those engineers who feel they have the right amount of work were used as the "control" or standard group against which the responses of the prefer more engineers are compared at each occupational level. Intra-occupational level comparisons were performed in this manner. However, inter-occupational level comparisons were more difficult to make as there is no way of knowing whether similar environmental and cultural factors exist to form a basis of comparison at different occupational levels. Undoubtedly, there are differences between occupational levels both environmentally and culturally and in the engineers that make up the group itself. Normally, under these circumstances, time series data are sought. An engineer is followed in his mobility pattern and changes are sought as he proceeds from one occupational level to the next. This was not possible. However, it is felt that enough similarities do exist among the engineers at relatively close occupational levels to form the basis of comparison. A relatively uniform progression of advancement is followed in the organization, with most engineers proceeding up the mobility ladder in relatively the same steps. Inter-occupational comparisons will primarily deal with engineering levels 1, 2, and 3, when transitions in the engineers' perspectives are discussed.

Summary of the Engineer's Responses Comparing Equivalent Managerial and Staff Positions

Interesting work (See Table 3, Appendix B).--The majority of right amount engineers at levels 1 through 5S feel that a staff professional position is more interesting than a managerial one. The percentages of those feeling this way run from a low of 49% at level 3 to a high of 69% at staff level 5S. The prefer more engineers at each of these occupational levels respond similarly but to a lesser degree. The range of percentages for the prefer more engineers runs from a low of 40% at staff level 5S to a high of 54% at level 1. In each of these cases, the percentages of the prefer more engineers favoring staff are less than those of the right amount of work engineers. At managerial levels, the reverse is true, with engineers at levels 4M, 5M, and 6M feeling that a managerial position is more interesting. The percentages range from

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41% to 47% of the right amount of work engineers being of this opinion. The prefer more engineers at these managerial levels appear to be even more strongly of the opinion that a managerial position is more interesting, except for those at level 6M. At level 5M, 71% of those who prefer more feel that a managerial position offers the more interesting work, while only 33% feel this way at level 6M.

Utilization of skills (See Table 4, Appendix B).--The majority of right amount engineers at levels 1, 2, 3, 4S, 5S, and 4M believe that a staff professional position utilizes skills to a greater extent than does a managerial position. The percentages of this opinion range from a high of 70% at level 1 to a low of 48% at level 5S. The prefer more engineers at these occupational levels feel less strongly about this, except at staff level 5S. The prefer more engineers' responses are less than the responses of the right amount of work engineers at all levels except for level 5S, where the responses are about equal with percentages of 48% and 50% for the right amount and prefer more engineers, respectively.

The percentage range for the prefer more engineers who feel a staff position makes better use of skills runs from a low of 38% at level 2 to a high of 58% at level 1. Managerial levels 5M and 6M feel that a managerial position utilizes skills better, with 38% and 37%, respectively, of the right amount of engineers feeling this way. The prefer more engineers feel this way even more strongly, with a 44% response, at both levels 5M and 6M. At almost every occupational level, the percentages of the prefer more engineers were greater than those of the right amount engineers who felt that a managerial position utilized skills better, and smaller than those who felt that a staff position utilized skills better.

Having contributions recognized (See Table 5, Appendix B).--At all occupational levels, the largest percentage of both the prefer more and the right amount of work engineers feel that a managerial position possesses more potential for having contributions recognized, except for the prefer more engineers at engineering level 1, where opinion is equally divided at 38% between staff and managerial positions. For the right amount of work engineers, percentages range from a low of 35% at managerial level 4M to a high of 63% at staff level 4S. For

the prefer more engineers, the same direction of response was exhibited, but by greater percentages at all levels, except level 2. The percentages ranged from a low of 38% at engineering level 1 to a high of 77% at managerial level 6M.

Salary (See Table 6, Appendix B).--The greater percentages of engineers in both work preference categories and at all occupational levels felt that salary in a managerial position is greater. The range of percentages for the right amount engineers went from a low of 38% at level 4M to a high of 84% at level 3. The percentages of the prefer more engineers who feel this way are greater than the percentages of the right amount of work engineers at all levels, except 1, 2, and 3. The range of percentages of the prefer more engineers runs from a low of 36% at level 1 to a high of 95% at staff level 4S.

Effort required (See Table 7, Appendix B).--Greater percentages at all occupational levels of the prefer more and the right amount engineers felt that a managerial position requires more effort. For the right amount of work engineers, 32% was the low at level 5S and 86% was the high at level 5M. Those engineers who prefer more responded in the same direction but the percentages feeling this way were lower than those of the right amount of work engineers at all levels, except level 3 and the staff levels, 4S and 5S. At managerial level 4M, the percentages are equal at 76%. Percentages of the prefer more work engineers range from a low of 29% at level 1 to a high of 80% at managerial level 5M.

Chance to make important technical decisions (See Table 8, Appendix B).--At level 1, the majority of engineers feel that a staff position affords the best chance to make important technical decisions; 64% of the right amount and 61% of the prefer more engineers at this level feel this way. This changes at level 2, where the opinion of the right amount engineers is almost equally divided between favoring staff or managerial positions at 44% and 48%, respectively. The percentages of those engineers who prefer more are slightly less in each case with 38% favoring a staff position, and 44% favoring a managerial position. At level 3, we have 54% of both the right amount and the prefer more engineers who feel that a managerial position offers a greater chance to make important technical decisions. Within three occupational levels,

the engineer has changed his perspective from believing that a staff position offers a better chance to make important technical decisions to believing that a managerial position does.

This transition in opinion occurs for both the prefer more and right amount of work engineers. Note that, while the percentages of the prefer more engineers of the majority opinion were less than those of the right amount engineers when opinion favored a staff position, opinion of the prefer more engineers becomes equal to the opinion of the right amount engineers when the majority opinion is on the managerial side.

The majority opinion remains on the managerial side for each of the succeedingly higher occupational levels. The percentages of the right amount engineers range from 53% at managerial level 5M to 62% at staff level 4S. Except for levels 5S and 5M, the staff and managerial levels of the prefer more engineers express the same opinion favoring a managerial position with percentage values ranging between 40% at level 5M and 89% at level 6M.

Prestige (See Table 9, Appendix B).--The majority of engineers at all occupational levels and in both work preference categories feel that a managerial position has more prestige. Typical percentages, for the right amount engineers, ranged between 64% at engineering level 1, to 92% at levels 3 and 4S. The majority opinion of the prefer more engineers was in the same direction, but was greater than the right amount engineers' opinions at most occupational levels. Only at levels 2 and 3 were the percentages of the right amount engineers who favored a managerial position greater. Percentages for the prefer more engineers range from 56% at level 2 to 100% at managerial level 6M.

Opportunity to follow own interest (See Table 10, Appendix B).--At level 1, the greatest percentage of engineers feels that a staff professional position offers more opportunity to follow their own interests; 53% of the right amount engineers are of this opinion. The prefer more engineers have an even higher percentage of 86% believing this. At level 2, staff is still felt to offer more opportunities by 69% of the right amount engineers. Those engineers who prefer more respond in the same direction with only 44%. At level 3, for the right amount engineers, the same attitude favoring staff is displayed by 67%, and by 50%

of those who prefer more.

At the first staff level, level 4S, 55% of the engineers who have the right amount of work feel that a staff position offers more opportunity to follow one's own interests. However, of the engineers who prefer more work at this occupational level, 54% feel that a managerial position offers more opportunity to follow one's own interests. We have a case where the prefer more and the right amount engineers hold opposing opinions. At staff level 5S, 75% of the right amount engineers, but only 69% of the prefer more engineers, favor staff. At level 4M, staff is favored by 56% of the right amount engineers, while only 47% of the prefer more engineers favor staff. At 5M, the position of the prefer more and the right amount engineers, though still favoring staff, are reversed with 52% of the prefer more and 45% of the right amount engineers favoring staff. Opinion was equally divided at level 6M between favoring a managerial or staff position by 44% of the prefer more engineers, while 41% of the right amount engineers is the majority and favors staff.

Ability required (See Table 11, Appendix B).--At occupational level 1, both those engineers who prefer more and those with the right amount of work feel that a staff position requires more ability, with percentages of 50% and 35%, respectively. At level 2, the opinion of those engineers who have the right amount of work is split about equally, with 24% feeling that more ability is required for a managerial position and 25% feeling more ability is needed for a staff professional position. Fifty-one per cent say about the same ability is needed for both staff and managerial positions. However, 32% of the prefer more engineers feel managerial duties require more ability. At level 3, 24%, the largest percentage of right amount engineers rating either managerial or staff positions as needing more ability, feel that more abilities are required of managers. At staff levels 4S and 5S, the engineers feel that greater ability is required for managerial tasks, but the difference between those favoring a managerial position over a staff position is not great.

The majority of engineers at managerial levels 4M, 5M, and 6M feel that managerial jobs require more ability. The percentages of the right amount engineers range from a low of 23% at level 6M, to a high

of 47% at level 5M. The prefer more engineers at these levels also favor a managerial position, with a high of 57% at level 4M, and a low of 40% at level 5M.

Again, note the shift from a staff orientation at level 1, to a managerial orientation at almost all of the higher occupational levels. At most levels there is a tendency for greater percentages of those engineers who prefer more work to select the managerial side as the one requiring more ability.

Potential for getting action on ideas (See Table 12, Appendix B). --Engineers at all levels feel that a managerial position offers more potential for getting action on their ideas. Percentages of the right amount engineers range from 53% at level 1 to 85% at staff level 5S. Those engineers who prefer more work are of the same opinion. However, the percentages believing that a managerial job offers greater potential for action on their ideas is, at every level except levels 2 and 5M, greater than for those engineers who feel they have the right amount of work. Percentages range from a low of 56% at level 2, to a high of 65% at level 4S.

Excitement (See Table 13, Appendix B).-- At level 1, the majority attitude of the right amount engineers is that more excitement exists in a staff professional position with 47% responding in this manner, and 50% of the prefer more engineers agree. At level 2, the attitude is reversed with 51% of the right amount engineers saying that more excitement exists on the managerial side. Even more of the prefer more engineers at level 2 express this opinion, with 56% feeling the same way. The right amount engineers at levels 3, 4S, and 5S are approximately split in their opinions. However, at these levels, the majority of those engineers who prefer more feel that a managerial position offers more excitement with percentages of 54%, 59%, and 50%, respectively.

The majority of the right amount engineers at managerial levels 4M, 5M, and 6M feel that a managerial position is more exciting, with percentages ranging from 63% to 70%. Of those engineers who prefer more, the majority feels the same way with percentages equal to, or better than, those for the engineers who have the right amount of work. The percentages of those who prefer more range from 66% at level 6M

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Here again is a transition in opinion between levels 1 and 2, from a point of view favoring a staff position to one favoring a managerial position. This opinion is carried out for the remaining higher occupational levels.

Potential for advancement (See Table 14, Appendix B).--The majority opinion of engineers at all occupational levels is that a managerial position has more potential for advancement with percentages of the right amount engineers ranging from a low of 64% at level 1 to a high of 84% at staff level 4S. Those engineers who prefer more also feel that there is more potential for advancement in a managerial position, however, the percentages feeling this way are greater than those of the right amount engineers at every occupational level, except levels 2 and 3. Percentages range from a low of 69% at level 2 to a high of 94% at staff level 5S.

Power to initiate programs (See Table 15, Appendix B).--The majority of engineers at all occupational levels feels that a managerial position offers more power to initiate programs. The percentages of right amount engineers having this opinion range from a low of 76% at level 1 to a high of 90% at level 3. For the prefer more engineers, the same opinion is expressed, but in most cases, except levels 1, 2, and 3, the percentages are greater than for those engineers who have the right amount of work. The percentages of prefer more engineers who favor a managerial position range from 72% at level 1 to 95% at level 4S.

Summary of the Engineers' Perspectives Toward the Desirability of Managerial or Staff Positions

Two steps must be carried out to see a particular occupational level as viewing a staff or managerial position as more desirable. The first step was carried out above -- determining opinion on certain factors to ascertain which position, managerial or staff professional, is thought to possess more of a certain factor. The second step is to determine which of these factors are desirable and which are not.

One method of solution might be to look at the goals of the engineers --what they actually seek. If an engineer seeks a certain factor

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and he feels that there is more offered in a managerial or staff role, then the managerial or staff role is more desirable to him. However, this approach has a tendency to cloud certain features, taking an "either or" point of view. For example, an engineer may state that it is very important to him to have an interesting job, but it is less important to have a job with high salary. On the basis of this, it may be concluded that the job with the more interesting work is the more desirable to the engineer. However, this point of view tends to look at each variable in isolation and does not take into consideration the mix and interaction of the job factors. How much money must the engineer be offered before he will take a job of lesser interest? If he is offered twice as much money, will he take a job with one-half the interest, or only three-quarters of the interest.

What this discussion reduces to is the fact that we are faced with a subjective problem that is difficult to resolve from a macroscopic point of view.

What can be done, however subjectively, is to rank the job factors from the evidence gathered in this study.

In general, all occupational levels rated a managerial position as having more potential for recognizing contributions, salary, effort required, prestige, potential for getting action on one's ideas, potential for advancement, and power to initiate programs. Most of these factors would appear to be desirable in a job.

Six or more of the eight occupational levels rated a managerial position as having more of these factors: chance to make important technical decisions, ability required, and excitement.

Opportunity to follow one's own interests was the only factor that was felt to be more present in a professional staff position by engineers at all occupational levels. However, the prefer more engineers, in general, evidenced lower percentages feeling this way, except at level 1. At the first staff level, 4S, those engineers who prefer more work are exactly opposed to those with the right amount of work. Fifty-five per cent of the right amount engineers feel that a staff position offers more opportunity to follow one's own interests, and 54% of the prefer more engineers feel that a managerial position offers more opportunity to follow one's own interests.

All engineers, except those at managerial levels, thought a staff professional position offered more interesting work and better utilization of skills. However, for these factors, the prefer more engineers felt more strongly than did the right amount engineers when the opinion of engineers in both work categories was on the managerial side, but lessstrongly than did the right amount engineers when both opinions were on the staff professional side.

In summation, the concensus in the engineering organization appears to be that a managerial position has more potential for having contributions recognized, salary, effort required, chance to make important technical decisions, prestige, ability required, potential for getting action on ideas, excitement, potential for advancement, and power to initiate programs.

On the other hand, a staff professional position is felt to offer more interesting work, better utilization of skills, and opportunity to follow one's own interests.

In general, the prefer more engineers agree with the opinions of the right amount engineers. However, the percentages of the prefer more engineers were in general less than the percentages of the right amount engineers when opinion favored a staff position, and greater than the right amount engineers when opinion favored a managerial position. In a small number of cases, the percentage majority of the prefer more engineers was not in the same direction as the percentage majority of the right amount engineers. In each case, the prefer more engineers felt that a managerial job offered more of the factor in question, while the right amount engineers felt that a staff professional position offered more of the factor.

In summary, it can be said that the prefer more engineer favors a managerial position to a greater extent than does the right amount engineer, and tends to perceive the managerial role as offering more of the job factors that were examined. In general, the prefer more engineer views a managerial position as being more desirable than an equivalent staff position to a greater extent than does the right amount engineer.

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Has The Dual Ladder System of Advancement Served Its Purpose

Since most of the job factors that can be called desirable are felt by the engineers to be more present in a managerial position, the question can be asked, does the dual ladder system really work? Rather than a method of promoting engineers who are really more interested in technical work, has it become a repository for persons who are just not good enough to be managers? When this question is considered, the thought occurs that this is a function that must be performed. If a technical person cannot become a manager because he has neither the ability nor the interest, or because there is no room for him in a managerial position, then he must be either promoted or held in his present position. The staff professional levels allow the engineer to be promoted and achieve a certain degree of reward even if this reward may be considered not quite so desirable as that obtained in a managerial position.

We have then, two points of view. Both points of view agree that a staff position is less desirable than a managerial position. However, the second point of view presents the possibility that a promotion to a staff position may be better than no promotion at all.

However, there is no need to be concerned here with a situation where either the dual ladder system is used or no promotion is possible for other than managerial personnel. There are other possibilities,such as the use of a rotating project hierarchy. A discussion of the relative merits of each system for handling managerial and staff professional personnel is not the objective of this section. The objective is to determine if the engineering personnel in this study are satisfied to a large extent with the working of the dual ladder system of advancement.

The engineering population was asked whether they felt that the dual ladder system of advancement helps people in their kind of work meet their personal goals. The response to this was a majority of "yes" at each occupational level. (See Table 16, Appendix B)

Responses of "yes" from the right amount engineers ranged from a low of 69% at managerial level 6M to a high of 96% at level 2. For the prefer more engineers, the same opinion of "yes" was expressed by all occupational levels. Percentages in this case ranged from 55% at managerial level 6M to 93% at level 1.

Most engineers in both work preference categories at all occupational levels appear to be satisfied with the degree the dual ladder system of advancement helps persons in their kind of work meet their personal goals.

Because a managerial position is acknowledged by the engineers as possessing certain desirable factors to a larger extent than does a staff professional position, the staff professional position is placed at a lower level relative to a managerial position. While the engineers readily admit that they would prefer a managerial position because of these certain factors, they feel that the dual ladder system of advancement offers a means by which they can satisfy their personal goals to some measure.

Occupational Level Perspective

In scanning many of the tables in which the responses to particular questions are broken down by occupational level, it is possible to see differences from one occupational level to the next. Even in comparisons of particular groups of occupational levels, such as the professional staff levels, the managerial levels, or engineering levels 1, 2, and 3, it is possible to detect differences. A consideration of the changes in the engineers' perspectives favoring a managerial or a staff position as offering more of a certain factor from one level to the next will be presented here.

The perspective of an occupational level is defined as the prevailing attitudes, opinions, and outlooks of the engineers that comprise the category called an occupational level. This discussion will concern itself with changing perspectives at levels 1, 2, and 3.

Some Examples of Changing Perspectives

Table 8, Appendix B, presents the opinion responses of engineers at each occupational level in the staff-managerial comparison series of questions for the variable "chance to make important decisions".

At level 1, 64% of the right amount engineers, the majority group, feel that a staff professional position allows more chance to make important technical decisions. At level 2, the percentage of right amount engineers feeling this way has fallen to 44%, while those feeling that a

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managerial position offers more chance to make important technical decisions has now become the majority viewpoint at 48%. At level 3, the percentage of right amount engineers favoring a staff position has fallen to 29%, while those favoring a managerial position has risen to 54%, with the remaining percentage of 17% rating a managerial and staff position as equal in the chance to make important decisions.

The percentage of engineers feeling that managerial and staff positions are equal in this regard has remained small and relatively constant at levels 1, 2, and 3. Therefore, changes in opinion favoring a managerial position have been accounted for by changes in opinion favoring a staff position. A similar situation is evident for the prefer more engineers.

Concerning the "chance to make important decisions," we have a shift from an opinion favoring a staff position to one favoring a managerial position as higher occupational levels are considered. This opinion favoring a managerial position can be seen to continue at all succeedingly higher occupational levels.

A similar transition in opinion occurs between levels 1 and 3 concerning opinion on ability required. (See Table 11, Appendix B) A shift also occurs in opinion between engineering levels 1 and 2 concerning the "excitement" a position offers. (See Table 13, Appendix B)

As was noted earlier, time series data for these variables are not available at this time. Groups of engineers were not followed as they advanced from one occupational level to the next. Separate groups of engineers have been compared at different occupational levels. This is considered to be a reasonable procedure as the same mobility patterns are followed for almost every engineer in the organization. Age, experience, and education are relatively similar at each occupational level.

The differences between the demographic and personal characteristics of engineers at occupational levels 1, 2, and 3 should be minimal. If these variables are assumed to be constant, the transition is caused by changes in the attitudes and opinions of the individual engineer as he is influenced by the organizational environment. The process by which this takes place can be explained in the following manner.

Engineers at level 1 are young and inexperienced. For almost

all of these engineers, this is their first job. All are college graduates. Throughout the technical college curriculum, they have come to believe that technical ability and achievement are the prime qualifications for advancement; that important technical decisions are made by the technical specialist; that technical ability is paramount; and that the staff professional work is more exciting because the staff professional carries out most of the dynamic technical work.

However, when this young engineer enters the organization and becomes acclimatized to the situation, he finds he is directed by managers who are not technical specialists, but rather have become generalists in managerial positions. He finds that important technical decisions are made not by the staff professional, but rather by those individuals in a managerial position. Perceiving this, he now views a managerial position more favorably, as a position that offers more of the rewards that are to be gained as a professional engineer.

Summary

This chapter has examined how engineers at various occupational levels view the engineering organization of this corporation. The attitude of the engineers toward the desirability of comparable staff and managerial level positions was also examined.

It was found that the majority of engineers view a managerial position as being more desirable than a staff position. The majority of engineers further feel that they would prefer to hold a managerial position rather than a staff position. This was true even for many engineers who were occupying staff positions.

It was also determined that changes in attitudes and perspectives toward the desirability of a managerial position, as opposed to a staff position, could be found. As engineers rose in the engineering hierarchy, especially at engineering levels 1, 2, and 3, they became more convinced that a managerial position offers more of certain desirable factors than does a staff position. There appears to be an organizational culture present in the organization which influences the young engineer in the direction of favoring a managerial position. This managerial orientation, although present in most engineers, was particularly pronounced among those engineers who felt they would prefer to do

more work.

This exposition of the engineer's perception of the engineering organization in which he works has been used to "set the stage" for further inquiry into the prefer more work responses. As the motivation behind the prefer more work response is investigated, the reader should keep in mind the engineers' perceptions of the greater desirability of a managerial position and the organizational environment which causes him to perceive that greater rewards may be obtained in a managerial position and induces him to become managerially oriented.

The next chapter will investigate what kind of engineer prefers more work, his location in the organization, and any peculiar personality characteristics he may exhibit. Specific differences by which the engineer who prefers more work can be differentiated from other engineers are investigated.

CHAPTER III

THE CHARACTERISTICS OF ENGINEERS WHO PREFER MORE WORK

Investigation into the motivation behind an engineer's preference to do more work necessitates an inquiry into whether the prefer more work response can be associated with engineers of a particular type or occupational level. It may be quite possible that a certain group of engineers simply does not have enough work to occupy their efforts. Or there may be certain peculiarities in the organization which tend to stimulate the prefer more work response from certain engineers.

In general, this chapter investigates whether there is a particular kind of engineer who prefers more work, or a particular place in the organization where engineers who prefer more work can be found. The question of what the engineer actually means when he states that he prefers more work is also considered in later sections of this chapter.

The Location in the Engineering Organization of Engineers Who Prefer To Do More Work

Table 17 lists the percentages of the total number of engineers by occupational level who state that they would prefer to do more work.

Aside from the higher percentages at engineering levels 1 and 3, and staff level 5S, the percentages of engineers expressing a preference for more work are distributed almost equally throughout the organization at all occupational levels. From the first engineering level to the highest managerial level, at least 20% of the engineers state that they prefer to do more work.

Note, however, that higher-than-average percentages of engineers who prefer to do more work occur at engineering levels 1 and 3 and staff level 5S. The mobility patterns of engineers in this organization may account for this. Young engineers enter the organization at engineering level 1. At engineering level 3, the decision is made either to

promote the engineer to a managerial or staff position. At staff level 5S, the chances of promotion to staff level 6S are extremely poor.

TABLE 17.--The Percentages of the Total Number of Engineers at Each Occupational Level Who Prefer to do More Work

Occupational Level	Total No. of Engineers	Engineers Who Prefer More	
		No.	%
6M	38	9	24
5M	114	25	22
4M	230	47	20
5S	50	16	32
4S	84	22	26
3	80	24	30
2	78	16	20
1	34	15	43

The common feature in the mobility pattern that each of these occupational levels seem to share is one of crisis in selection. At level 1, the young engineer enters the organization with little or no experience. The engineer at this level is young and highly motivated and desires to demonstrate his abilities, and become a valued employee in the organization. "It is a very difficult proposition to give a new engineer (junior engineer) a meaningful work assignment. Due to the press of schedule and other demands, there is a tendency for managers to put junior engineers on make-work assignments simply to get them out of the way for awhile while the junior engineer 'learns the ropes'."[1] The young engineer desires more work of the sort he has been trained to do.

At engineering level 3, the next great selective process takes place. The engineer has "made the grade" at engineering levels 1 and 2, and has been retained by the company. However, now at level 3, the decision is made whether to promote the engineer to a managerial or a staff position. The previous chapter has provided information on

[1]Personal correspondence with a member of the Corporation's personnel research staff

how important this promotion is in this engineering organization. The engineer knows that promotion to a managerial position is based on merit, while promotion to a staff position is based primarily on longevity and experience. The engineer knows that at level 3 he must distinguish himself in some manner so that he may be viewed as managerial material. Hence the engineer who is interested in achieving higher mobility and a managerial position seeks more work. Work which will allow him to distinguish himself from the group. The question of just what type of work the engineer who prefers more desires will be discussed later in the chapter.

At staff level 5S, another condition exists. There is little chance of advancement from this position to staff position 6S. For this reason, it is proposed that there are two possible reasons for an engineer at this level to prefer more work. The first is that he may wish to distinguish himself and somehow be one of the few promoted to staff level 6S. The second is that he may realize there is no path of mobility out of his present occupational position, and he seeks more stimulating and interesting work for its own satisfaction.

In lieu of personal interviews, the evidence at hand indicates that these hypotheses are at least a partial explanation of the actual situation that exists in the engineering organization of this corporation.

However, it is felt that the real significance of these findings is that no one particular occupational level can be specifically associated with the prefer more work response to the exclusion of any other occupational level.

If no occupational level in particular can be associated with those engineers who prefer more work, is there any relationship to the engineers' type of immediate work groups?

The Prefer More Response and Work Group Type

Table 18, Appendix B, lists five immediate work group types generally found within the Corporation's engineering organization: a complete project group; a part of a larger project group; a service group (test set design, machine design, etc.); a functional group (specialists in thermodynamics, solid state physics, etc.); and a product group (specific product lines). Listed by occupational level are the

number and percentages of the right amount and prefer more engineers as found in each type of immediate work situation.

It is assumed that at each occupational level the probability of finding either a right amount or prefer more work engineer in a particular immediate work group type is the same. However, since the type of work performed at each occupational level may differ, comparison is made only between the prefer more and right amount engineers at each particular occupational level. This is done to hold constant as many other variables as possible. For example, there is no reason to assume that the same type or number of immediate work groups will be found on each occupational level. Therefore, a meaningful analysis of differences can only make intra-occupational level comparisons.

On the basis of this type of comparison, using the Chi square test in conjunction with independence values, no statistically significant differences are apparent to indicate a relationship between the location of engineers who prefer more work and the immediate work group in which they are involved. The immediate work group type appears to have little, if any, effect on the prefer more responses.

Demographic Variables

Age.--Because of company administrative problems, it was not possible to determine the ages of the engineers in this study. However, certain factors act to fill the gap left by the lack of this factor. The Corporation, for the most part, follows a policy of promotion or discharge. Hence an engineer's occupational level roughly indicates his age and experience, as an engineer entering the organization with prior experience would not enter at the first engineering level, but would be placed at an occupational level commensurate with his experience.

Age grade, if not age, can then be satisfactorily related to occupational level. Referring again to Table 17, The Percentages of the Total Number of Engineers at Each Occupational Level Who Prefer More Work, on page 32, relating occupational level to the prefer more response, it can be seen that there is no particular occupational level that can be specifically associated with the prefer more response. However, the youngest engineers at level 1, and those engineers at levels 3 and staff level 5S, do evidence the highest percentages of persons

prefering more work. The possible reasons for this were discussed earlier.

Education.--Table 19, Appendix B, lists the highest level of education attained by the total prefer more and the right amount of work preference engineers at each occupational level.

The greatest majority of engineers, 60% have a Bachelor's degree. Only 1% are educated only up to or including high school. Those having only some college make up 14% of the total engineers, while 22% have a Master's degree and 4% possess a Doctor's degree.

Those engineers with a Bachelor's or a Master's degree can be found at every occupational level. There are no engineers in this sample with a Doctor's degree at engineering levels 1 and 2, however, they are found at all other occupational levels in the engineering organization. Those engineers possessing some college education, but not a Bachelor's degree, can be found at all occupational levels, except engineering level 1. All of the engineers in this sample who are educated only up to or including high school are found at the first managerial level, level 4M.

Table 20, Appendix B, lists the number and percentage of engineers by educational attainment and occupational level who prefer a certain amount of work. At each occupational level the number of engineers who prefer more work or who have the right amount of work are summed individually and then their percentages, out of the total number of engineers at that occupational level, are shown. For example, at managerial level 6M, 29% of the engineers prefer more work, while 71% feel they have the right amount of work. In this same manner, the number of engineers at each level of education was added and the percentages of the total found for those who prefer more or have the right amount of work. For example, again at managerial level 6M, 30% of those engineers with a Master's degree prefer more work, while 70% feel they have the right amount of work.

It was assumed that, if a particular level of educational attainment did not influence the work preference response of the engineers in that category, the percentages of engineers who prefer more or have the right amount of work in that educational category would be the same as the percentages for the total engineers at that occupational level. For example, at level 6M, 29% of the total number of engineers prefer

more work. At the Bachelor's level, 27%, and at the Master's level, 30% of the engineers prefer more work. However, at the Doctoral level, 67% of the engineers prefer more work. On the basis of the above assumption, engineers at occupational level 6M who hold a Bachelor's or Master's degree do not tend to respond with a preference for more work to any greater extent than do the total number of engineers at that level. However, the engineers with a Doctor's degree are over represented among the prefer more work engineers at this occupational level, with 67% preferring more work. This method of analysis was used to consider each occupational level and to investigate the relation of a particular educational level to the prefer more work response.

There are no engineers having only up to or including a high school education who prefer more work. Those engineers who have had some college are under represented at all occupational levels except staff levels 4S and 5S, where they are over represented, and managerial level 4M where they have a normal representation in the prefer more work group. Holders of a Bachelor's degree are slightly over represented at engineering levels 1 and 2 and staff level 4S. The greatest over representation in the prefer more group of Bachelor's degree holders occurs at staff level 5S. Normal representation in the prefer more group occurs for holders of the Bachelor's degree at all other occupational levels.

For holders of graduate level degrees, at the Master's degree level, under representation in the prefer more category occurs at engineering levels 1 and 2, staff levels 4S and 5S, and managerial level 4M; over representation occurs at engineering level 3 and managerial level 6M. Since there is only one holder of a Doctoral degree at engineering level 3, no conclusion may be reached; however, holders of the Doctoral degree are under represented in the prefer more category at staff levels 4S and 5S, and over represented at all managerial levels.

Considering all occupational levels, it appears that no one educational level contributes a significantly higher number of engineers to the prefer more group. There is no statistical indication that the prefer more response is related to any particular level or levels of education.

Those engineers with only undergraduate degrees are represented as strongly among prefer more engineers as those with advanced degrees.

Only those engineers with a high school education or less are not represented in the prefer more category. However, it should be remembered that the sample consists of few engineers who have not had at least some college training. Less than 1% of the population studied has not had some college, so the lack of representation of this educational level is not statistically significant.

As yet, little has been uncovered by which the engineer who prefers to do more work can be completely characterized. It has been determined that a significant percentage of engineers who prefer to do more work occurs among young engineers and engineers at particular points in their mobility pattern. However, sizeable proportions of engineers of other ages and other occupational levels also prefer to do more work. The prefer more work response of these engineers is unexplained. The remainder of this study will investigate this problem.

Personality and Perception Factors

An individual's perception of a situation is influenced by his personality. One's outlook is affected to a large extent by his personality and background. By investigating perceptions of situations, it is possible to characterize the outlook of the type of engineer who prefers more work.

Comparison is made here between the responses of the engineers who prefer more and those who feel they have the right amount of work. These engineers are compared from the point of view of direction of emphasis, and complete reliance is not placed on statistical levels of confidence alone. While high levels of confidence do not always appear when differences are compared at each occupational level, the statistics do become quite significant when it is considered that a certain tendency has been registered eight out of eight times. This approach will be used in considering the significance of the findings in this study.

The engineers were asked how well satisfied they were with the advancement they had received since starting to work in this corporation. Their responses are tabulated in Table 21, Appendix B. Those who prefer more work, at all occupational levels, are, in general, less satisfied with their advancement. At every occupational level, the percentages of engineers feeling satisfied with their advancement were lower

for the prefer more than for the right amount engineers.

Those who prefer more also register a lower level of satisfaction when asked if the work they are now doing represents a satisfying kind of job for them. (See Table 22, Appendix B) At every occupational level, the percentage of the prefer more was lower than of the right amount engineers who stated that their work is very satisfying. The same relationship existed at all occupational levels, except level 6M, for both categories of engineers who found their work only partially satisfying.

When asked how they liked their jobs -- the kind of work they do, those engineers who prefer more, at all occupational levels, had a lower percentage who felt their job was good or very good. The percentage of engineers rating theirjob as average or below was also greater among the prefer more than the right amount engineers at every occupational level. (See Table 23, Appendix B)

Also, there was a lower percentage of prefer more engineers who feel that the work they are presently doing is helping them to achieve their more importance goals. (See Table 24, Appendix B) At every occupational level, a smaller proportion of prefer more engineers felt their present work was helping them to achieve their more important goals.

At every occupational level, the prefer more engineers rated their jobs more poorly than did the right amount engineers as supplying what they want from a job. (See Table 25, Appendix B)

In summation, comparing the prefer more and the right amount of work engineers, the prefer more engineers are in general less satisfied with their work. The engineers comprising the prefer more category do not appear to derive the same degree of satisfaction from the same type of work.

This generalization appears particularly warranted, since each occupational level has been considered individually in an effort to hold the type of work and other organization variables as constant as possible.

Work Involvement

Work involvement is an important factor in a study of this type.

For, if the satisfaction an engineer derives from his work is to be considered, it is necessary to consider how important work is to the engineer and how deeply he is involved in it. Two types of involvement are concerned here. Involvement in the work organizationand, since we are dealing with professional engineers, involvement in the technical nature of the work itself. It is expected that the engineer who is deeply involved in his work would derive a large part of his life's satisfaction from his work. Therefore , a higher degree of work involvement, a higher demand for satisfaction from work, may be one possible explanation for a higher degree of work dissatisfaction. It may then be possible to explain the prefer more engineer's greater dissatisfaction with his work content as being related to a higher work involvement.

Some people in technical work are very deeply involved in their work. To others, their work is just another job. In general, when asked their feelings on this, the response of those engineers who prefer more work is one of lesser involvement than the response of those who have the right amount of work. Table 26, Appendix B, presents the results of this inquiry. Only at staff level 5S did the responses of the prefer more and right amount of work engineers coincide. At all other occupational levels, seven out of the eight, the distribution of responses from the prefer more engineers were skewed toward lesser job involvement while the responses from the right amount engineers were skewed toward greater job involvement.

However, when the engineers were asked how important a place does their work occupy in their lives, disregarding economic necessity; the opposite response was recorded. Table 27, Appendix B, lists the responses to this question.

At five of the eight occupational levels, levels 1, 2, staff levels 4S and 5S, and managerial level 4M, there were larger proportions of prefer more engineers who felt that work was extremely important, or the single most important thing in their life. At level 3 and managerial level 5M, the differences between the two work preference groups amount to only 3% at most. Only at managerial level 6M is there a significantly greater proportion of right amount than prefer more engineers who feel that their work occupies an extremely important position in their life.

Comparing Tables 26 and 27, Appendix B, it may be concluded that while the prefer more engineers have a tendency to be less involved in their job, their work tends to be their central life interest to a greater extent than for the right amount engineers.

These results would appear to be incongruous, for when work becomes a central life interest it is usually as a result of high job involvement. However, the seeming incongruity may be explained by looking more closely at the questions.

The first question deals with involvement in technical work and the prefer more engineers' responses indicated lesser involvement. The second question deals with work in general, and here the responses indicate greater importance of work in the lives of the prefer more engineers. The seeming incongruity may be explained if the responses of the prefer more engineers are interpreted as indicating a lesser interest in the technical nature of their work, but that their job in general holds a position of high importance in their lives.

The Prefer More Engineer as a Malcontent

Until this point, the line of investigation has uncovered dissatisfaction. Those engineers who prefer more work have evidenced a greater degree of dissatisfaction on matters concerning advancement and the kind of work they do. The prefer more engineers also displayed greater doubt that the work they were presently doing was helping them to achieve their more important goals.

In many organizations, there may exist a certain percentage of individuals who are overly critical. These individuals tend to be hostile to the work situation and view almost all of the organization's functions as being poorly run and ill-defined. It is possible that the engineers who prefer more are a group of malcontents.

This does not seem to be the case.

The engineering population was asked to rate their job on physical working conditions, salary considering duties and responsibilities, and salary compared with other companies.

For each of these points, engineers who prefer more work cited these conditions as being good or very good as often, if not slightly more often, than did the right amount engineers. Apparently the prefer

more engineers are not a generally dissatisfied malcontent group, but one with selective discontents. (See Tables 28, 29, and 30, Appendix B)

When asked to rate their job on opportunities to move to a better job in the future, the prefer more engineers evidence a poorer response to rating their job as good or very good at every occupational level. (See Table 31, Appendix B)

The significance of this question may be interpreted better if the term "better job" is clarified. It has been shown that those who prefer more are dissatisfied with the kind of work they do and not with the physical conditions of their job or their compensation in general. If, in looking at the rating of the opportunities to move to a better job in the future, the term "better job" is changed to "better work tasks," the situation may become more clear. It is hypothesized that the engineer who prefers more work is dissatisfied with the type of work he is asked to perform.

The next section will focus on just what work the engineer refers to when he states that he would prefer to do more work. It will be shown that the engineer most probably refers to the type and not the quantity of work.

What An Engineer Means When He States: "I Would Prefer to do More Work."

One interpretation of the engineer's preference for more work is simply that the engineer is not completely occupied and desires to be. Of more complexity is the problem of defining what being occupied really means. It may be concerned with the quantity, the intellectual demands, or the time demands of work, or perhaps a combination of factors.

It is hypothesized that the engineer is speaking primarily in terms of the intellectual demands made by the type of work he performs. An engineer's work day may be completely occupied in terms of the quantity of work performed; however, the engineer may still feel that the actual intellectual demands made by his job are relatively light. He therefore prefers to do more work. Work being defined in terms of what the engineer considers to be appropriate work, which is what he

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If the engineer is speaking primarily in terms of intellectual demands made by the type of work he performs, it should be expected that engineers who prefer more work will perceive their work as making lighter intellectual demands on them than do those who have the right amount of work.

Table 32, Appendix B, presents the engineers' ratings of the intellectual demands of their present jobs. The responses are categorized by occupational level. Each occupational level is further divided according to the prefer more and right amount work preference responses.

At every occupational level, the engineers who would prefer more work have the greatest percentage of engineers perceiving the intellectual demands of the job as being light. This ordinal relationship with those engineers who prefer more having a greater percentage of engineers who perceive the intellectual demands of the job to be light, and those who have the right amount of work, a lesser percentage, can be seen to exist at all occupational levels.

Further, among the prefer more engineers, the percentages perceiving the intellectual demands of their jobs as being light are always greater than those perceiving the intellectual demands to be heavy at six of the eight occupational levels.

The evidence in Table 32, Appendix B, concerning the engineers' perceptions of the intellectual demands of their work indicates that, while the prefer more and right amount engineers perform the same work, the prefer more engineers perceive the intellectual demands of their work as being lighter.

When the population of engineers was asked if, during the past year, they had ever been asked to work on a job that they felt could have been handled by someone with less technical training than themselves, those who prefer more work responded in the affirmative to a greater degree than did the right amount engineers at all occupational levels. The results are tabulated in Table 33, Appendix B. For those who prefer more, the greater majority, at all but occupational level 5S, responded that they felt their jobs could have been handled by someone with less

technical training. At staff level 5S, the prefer more engineers were equally divided between those who felt this was true and those who did not.

Feelings are expressed by both the prefer more and right amount engineers at all levels of the organization that improper utilization of technical personnel does exist. These feelings are, however, expressed by greater percentages of the prefer more engineers than right amount engineers. When the engineers were asked if they would agree that there is considerable mal-utilization of people in their kind of work -- too many professional people working on details that others could handle, no less than 75% and up to 100% of the prefer more engineers at each occupational level said they agreed either partly or fully with this statement. (See Table 34, Appendix B)

Engineers who prefer more work register a higher level of dissatisfaction concerning the work they are assigned than do the right amount of work engineers. Since the prefer more engineers also register a greater feeling of lighter intellectual demands and poor technical utilization, their dissatisfaction with their work appears to be related to the technical and intellectual quality of this work.

It was hypothesized that the engineers who preferred to do more work were speaking in terms of the quality or level of the technical work and not the quantity of work they were asked to perform. This hypothesis is substantiated by the data presented in the past pages.

However, it was shown earlier that the prefer more response cannot be specifically associated with any particular type of immediate work group or occupational level. Therefore, the type of work performed and its content should be the same for both the prefer more and the right amount engineers. If this is true, still left to be explained is why the prefer more engineers evidence greater levels of dissatisfaction with the content of their work.

It is hypothesized that the higher levels of dissatisfaction with work content evidenced by the prefer more engineers are based upon the prefer more engineers attaching greater importance to technical and scientific personal goals. Since the prefer more engineers attach greater importance to technical and scientific personal goals, they are more critical of the technical work they are asked to perform. The

prefer more engineers desire higher level technical work for the personal satisfaction they derive from the work.

If this interpretation is correct, we should expect to find greater percentages of prefer more engineers than right amount engineers holding technical and scientific goals to be of high importance. This hypothesis will be tested in the following chapter where the importance attached to selected personal goals by the right amount and the prefer more engineers are compared.

It will be shown that the hypothesis is incorrect. Rather than attaching greater importance to technical and scientific goals, the prefer more engineers attach higher importance to managerial and organizational goals.

CHAPTER IV

THE PERSONAL GOALS OF THE ENGINEER

In the past chapter it was hypothesized that one of the reasons why a certain group of engineers preferred to do more work was because these engineers had a hierarchy of personal goals which held scientific and technical accomplishments to be very important. In this chapter, evidence to substantiate this hypothesis is sought. If the prefer more engineers hold technical and scientific accomplishments to be very important, then their preference for more work could be explained by their desires for higher level technical work to satisfy these personal goals. This hypothesis would be substantiated if the engineers who prefer more work were compared with engineers who have the right amount of work and the prefer more engineers were found to evidence greater percentages who felt scientific and technical goals to be of great importance. This comparison will be made and the hypothesis tested in the following sections.

In this chapter an analysis of the importance of certain personal goals to the engineers in this study is made at each occupational level. A comparison is then made between the goals of the prefer more and right amount of work engineers and a hierarchy of the goal factors for the total population and separate work preference groups is presented.

The data presented in this chapter are the responses of the population of engineers to a series of questions making up the "Personal Goals Description" section of the questionnaire. The questions making up this section of the questionnaire and a factor analysis of these questions are presented in Appendix C.

The questions used here were designed to receive responses in terms of degree of importance, using "none" and "utmost" as anchor points. A typical question is: "How important is it to you to publish articles in technical journals?"

Of no importance whatsoever									Of utmost importance
0	1	2	3	4	5	6	7	8	9	10
None										Utmost

The respondent rates the importance of various personal goals on a zero to ten scale of importance. Zero meaning of no importance whatsoever and ten meaning of utmost importance. In reporting the results, categories 8-10 are grouped together and are taken to indicate that an engineer responding with eight or above is saying that the goal is of great importance to him. Similarly, categories 0-2 are grouped together to form the "of little importance" group, and categories 3-7 are grouped together to form the "of fair importance" group.

This particular division of the responses has been chosen because past experience of the Corporation's personnel research staff indicates that these categories approximate their designated meaning, and using these categories as an index of importance results in a good distribution of over-all importance of various goals, the range being from 0% to 100% saying very important.

Selection of Goal Factors from Total Questions in Personal Goals Description Section

In order that a questionnaire study of this type can be meaningfully interpreted, it is necessary to relate the total number of questions in the questionnaire to the number of variables contained within as small a number of derived variables or factors, as possible. One method of doing this is through the use of factor analysis.

The aim in factor analysis is to account for, or explain, the matrix of covariances by a minimum, or at least a small number of hypothetical variates or "factors". Put simply in correlational terms, the first question asked is whether significant correlation exists; that is, whether the correlation matrix differs significantly from the identity matrix. If the experimenter is satisfied that this is so, he then asks whether a random variate f_1 exists such that the partial correlations between the pairs of variates are zero after the effect of f_1

has been removed. If the correlation matrix is still unexplained, he inquires whether two random variates, f_1 and f_2, exist so that the partial correlations between pairs of variates are zero after the effects of both these variates have been removed, and so on.[1]

A factor analysis of the "Personal Goals Description" section of the questionnaire was performed by Dr. Richard R. Ritti of Stamford, Connecticut. This was prepared from a maximum likelihood program written by Rolf Bargmann.[2] The rotation is an oblique rotation based on Thurstone.[3] The results of this factor analysis are shown in Appendix C.

From this method of factor analysis, ten factors were determined. It should be noted that through the use of factor analysis, factors are not uniquely determined as to what they actually are. The method only indicates that a factor exists and what its relationship is to the questions from which it is derived. Therefore, the naming of a factor is left to the experimenter. See Appendix C.

The ten personal goal factors that are investigated are as follows: scientific, technical, monetary, managerial, company affiliation, dependency, security and good life, autonomy, staff position, and power goals. The specific questions asked of the engineers in this study and used as a measure of the goal factors are found in Appendix C.

To better understand the structure of goals which the engineer in this organization has, the important goals of the total group of engineers at each occupational level will be examined. In the following sections, specific goal factors are considered individually and then arranged into a hierarchy by order of importance. When the general goal perspectives

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[1] W. G. Howe, "Some Contributions to Factor Analysis," United States Atomic Energy Commission Report ORNL-1919, 1955, p.8, et. seq.

[2] For an exposition of the maximum likelihood method, see D. N. Lawley, Factor Analysis as a Statistical Method, London: Butterworth and Co., 1963, pp. 10-27.

[3] L. L. Thurstone, "An Analytical Method for Simple Structure," Psychometrika, Vol. 19, No. 3, September, 1954, pp. 173-182.

of the engineers in this study are determined, the actual testing of the hypothesis will begin. To test the hypothesis, differences in the importance of goals between the prefer more and the right amount engineers are considered in later sections.

The tables relating to this chapter have three listings under each occupational level. These are labeled total, prefer more, and right amount.

The heading "total" indicates the total number of engineers in this study including all work preference categories and their responses to the variable the table represents. There are three work preference categories, prefer more, right amount, and too much, into which the engineers were divided. All of these work preference categories are included under the total designation. This total population is analyzed to investigate the general feelings of engineers toward specific goals without regard to their work preference.

However, to substantiate the hypothesis under investigation in this chapter, it is necessary to compare the responses of the prefer more and right amount work preference engineers. Their number and responses to the questions are listed under the respective headings of prefer more and right amount. Since these are only two of the three possible work preference categories, their numbers do not add up to the number in the total category, as the too much group has not been included in the tables. It should not, however, be assumed that if the prefer more and right amount numbers are added and this sum is subtracted from the total number that the number of too much engineers can be found. This is because the figures shown in these tables are the result of a three-way computational breakdown. In this case, the three-way breakdown consists of first dividing the total number of engineers into groups according to their occupational level, then dividing the engineers at each occupational level into groups according to their work preference, and then dividing these groups according to their response toward the particular factor under investigation. If, for a particular engineer, the data do not contain information for any one of the three variables used in the breakdown, this engineer would be excluded from the table by the computer. For this reason, since in each table each row is measuring one different variable of the three, the number of

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engineers in each work preference category will not necessarily sum to the total number of engineers. For similar reasons, the number of engineers in the three categories under each occupational level is not constant for each table and can be seen to vary from table to table.

The Importance of Selected Personal Goals to the Engineer by Occupational Level

Scientific goals--Engineers at none of the occupational levels rated scientific goals as being of any greater than fair importance to them.

Establishing a reputation outside the company as an authority in their field was rated by the majority of engineers at every occupational level as being of only fair importance. Percentages ranged from 46% at level 1 to 64% at managerial level 5M. (See Table 35, Appendix D)

For engineers at all occupational levels, except for the highest managerial level 6M, the same attitude of only fair importance existed toward the other two goal factors making up the scientific goals category. Publishing articles in technical journals and communicating ideas to others in their profession through papers delivered at professional meetings were considered to be of little importance to engineers at level 6M. (See Tables 36 and 37, Appendix D)

In most studies of this nature, engineers and scientists are grouped together in a category which is usually called scientific personnel. These scientific personnel are supposedly highly motivated by, and dedicated to, the scientific method. To search dispassionately for the facts and to exchange these facts with the scientific community is one of the major components of the scientific method.

The fact that scientists' goals may be influenced by the scientific method is not under investigation in this study. However, the findings noted above indicate that engineers are not highly influenced in the direction of the scientific method. This would suggest that it may be erroneous to study engineers and scientists as a group, but rather that they might better be studied in separate groups.[4]

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[4]A discussion of the differences in interests, goals and characteristics among different types of engineers and scientists is given in: R. B. Cattell and J. E. Drewdahl, "A Comparison of the Personality

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Engineers often consider themselves to be a professional group and desire to be treated as such.[5] Traditionally, professional groups are usually identified as ones whose members, among other things, are directed toward the values of the group, rather than toward those of the organization in which they are employed. In light of this, it is interesting to note the responses made by engineers at the various levels toward the factor "desire to establish a reputation outside the company as an authority in your field."

Apparently, the most professionally oriented of all the engineers are those at staff level 5S and engineering level 1.

Level 1 engineers are recent college graduates and have little experience in industry. Their prime concern is adapting to the industrial organization, and maintaining their position in it. The relatively high response to the importance of establishing a reputation outside the company as an authority in their field might be explained by their desire to appear useful to this organization and to other organizations where they might seek employment should they not be successful here. These assumptions appear warranted when the responses of the engineers at level 1 are considered concerning the importance of publishing articles in technical journals and communicating ideas to others in their profession through papers delivered at professional meetings, and the abrupt change in feelings of importance which take place at level 2, for

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Profile (16PF) of Eminent Researchers with that of Eminent Teachers and Administrators and of the General Population," British Journal of Psychology, 1955, 44, pp. 249-261; Peter W. Hollis, "Human Factors in Research Administration" in Rensis Likert and Samuel P. Hayes, Jr., Some Applications of Behavioural Research, Paris, France: UNESCO, 1957, pp. 136-142; William Kornhauser, Scientists in Industry, Conflict and Accommodation, Berkeley and Los Angelos: University of California Press, 1963, pp.152-153; Frank P. Melograno, "The Motivation of Scientists and Engineers," in Getting the Most from Product Research and Development, Special Report No. 6, American Management Association, 1955, Chapter 5; and Renato Taguire, "Value Orientation and the Relationships of Managers and Scientists," Administrative Science Quarterly, June 1965, pp. 39-51.

[5]Cf. John W. Riegel, Administration of Salaries and Intangible Rewards for Engineers and Scientists, Ann Arbor: Bureau of Industrial Relations, University of Michigan, 1958; Second Section pp. 12-13.

"establishing a reputation outside the company as an authority in their field."

At staff level 5S, the engineer occupies a position that offers little chance of promotion. His chances of transferring to the managerial side of the organization or for promotion to staff level 6S are virtually non-existent. While a staff engineer at level 5S has a relatively secure position, if he still wishes to grow he has little opportunity but to grow in his field.

Considering the above findings, it is difficult to consider the engineers in this study as being professionals in the traditional sociological sense of the word.

Exposition of the traditional definition of a profession can be found in the classic study by Carr-Saunders and Wilson.[6] Basically, the benchmarks of a profession are taken to include: (1) the existence of a body of principles, techniques, skills and specialized knowledge; (2) formalized methods of acquiring training and experience; (3) the establishment of a representative organization with professionalization as its goal; (4) the formation of ethical codes for the guidance of conduct; and (5) the charging of fees based on the nature and extent of services, but with due regard for the elevation of the service concept over the desire for monetary compensation.[7]

The traditional view of a profession -- which might be called a functional view -- sees a profession largely as a relatively homogeneous community whose members share identity, values, definitions of role and interests.[8] There is room in this conception for some variation, some differentiation, some out-of-line members, even some conflict; but, by and large, there is a steadfast core which defines the professions, deviations from which are but temporary dislocations.

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[6]A. M. Carr-Saunders and P. A. Wilson, The Professions, Oxford, England: Oxford University Press, 1933.

[7]Dalton E. McFarland, Management: Principles and Practices, New York: The Macmillan Co., Second Edition, 1964, p. 13.

[8]Cf. William J. Goode, "Community Within a Community: The Professions," American Sociological Review, XX, 1957, pp. 194-200.

Socialization of recruits consists of induction into a common core. There are norms and codes which govern the behavior of the professional toward insiders and outsiders. In short, the sociology of professions has largely focused upon the mechanics of cohesiveness and upon detaching the social structure (and/or social organization) of given professions. But this kind of focus and theory tend to lead one to overlook many significant aspects of professions and professional life. Particularly, the conflict -- or at least difference -- of interests within the profession.

Another way in which these engineers may be considered professionals is to consider them so in a "process" sense, or as their profession being a replacement for a trade union.[9]

The "process" or "emergent" approach to the study of professions differs from the prevailing "functional" or traditional point of view because it considers conflicting interest and change. There are many identities, values, and interests within a profession. These amount not merely to differentiation or simple variation. They tend to become patterned and shared; coalitions develop and flourish -- and in opposition to some others. We can call these groupings which emerge within a profession "segments".

Some of the values about which the segments of a profession may differ and be in conflict with are: (1) sense of mission, (2) work activities (the most characteristic professional act), (3) methodology and techniques, (4) clients, (5) colleagueship, (6) interests and association, and (7) public relations.

From a process point of view, professions may be thought of as loose amalgamations of segments pursuing different objectives in different manners and more or less delicately held together under a common name at a particular period in history.[10]

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[9]For a discussion of professionalization as a replacement for a trade union, see: A Professional Look at the Engineer in Industry, National Society of Professional Engineers, Washington, D.C.; and J.F. Culley, A Primer on Engineering Unionism, Iowa City, Iowa: Bureau of Labor and Management, College of Commerce, State University of Iowa, Reprint Series No. 12, June, 1959.

[10]R. Bucker and A. Strauss, "Professions in Process," American Journal of Sociology, IVXI, 1961, pp.325-334.

Under these definitions the engineers in this study can be considered as making up a profession even though they do not appear to display the traditional professional qualities.

Technical goals.--Having the opportunity to explore new ideas about technology or systems is rated by the largest proportion of engineers at all occupational levels as being of great importance to them. Percentages rating this goal factor as being of great importance range from 52% at managerial level 4M to 71% at managerial level 6M. (See Table 38, Appendix D)

Having the opportunity to work on complex technical problems is considered by the highest proportion of engineers at levels 1, 2, 3, and staff levels 4S and 5S as being of great importance to them. However, engineers at all managerial levels, 4M, 5M, 6M, rate this goal factor as being of only fair importance to them. (See Table 39, Appendix D)

The opinion of the engineers is about equally divided between fair and great on the importance of working with others who are outstanding in their technical achievements. There are, however, some differences. The majority of engineers at levels 1 and 3 feel this goal factor to be of great importance, however, at levels 2, staff level 4S, and managerial levels 4M and 5M, the highest proportion express the attitude that this goal factor is of only fair importance to them. The opinion of managerial level 6M and staff level 5S is about equally divided between the goal being of fair or great importance. (See Table 40, Appendix D)

The importance of working on projects that require learning new technical knowledge is thought to be of great importance by the majority of engineers at level 1, and of fair to great importance by the majority of engineers at levels 2 and 3. However, at staff levels 4S and 5S, and managerial levels 4M, 5M, and 6M this goal is considered to be of only fair importance. (See Table 41, Appendix D)

Engineers at almost all occupational levels feel that the goal factor of working on projects that utilize the latest theoretical results in their specialty is only of fair importance. Only at level 1 is opinion equally divided with the same percentage, 46%, of the engineers feeling this goal to be of fair or great importance. (See Table 42, Appendix D)

Monetary goals.--Making a great deal of money is considered by all, and making more money than the average college graduate is considered at most occupational levels by the greatest proportion of engineers to be only of fair importance. (See Tables 43 and 44, Appendix D) Only at managerial levels 4M and 5M is the factor of making more money than the average college graduate considered to be of great importance by the majority of engineers.

On the other hand, receiving better-than-average salary increases is considered by the majority of engineers at level 1 and 2, staff level 5S, and managerial levels 4M, 5M, and 6M as being of great importance. (See Table 45, Appendix D) At the remaining occupational levels, 2 and staff level 4S, the majority of engineers view the goal factor as being of only fair importance.

Managerial goals.--The goal of becoming a first-line manager in one's line of work is considered by the majority of engineers at five of the eight occupational levels as being of great importance. The majority of engineers at levels 2, 3, and all managerial levels hold this goal to be important, while the majority of engineers at level 1 and staff level 4S view this goal as being of only fair importance. At staff level 5S the opinion of the engineers is divided almost equally between the importance categories at 35%, 31%, and 35%. (See Table 46, Appendix D)

Only the majority of engineers at managerial levels 4M, 5M, and 6M feel that a goal of learning how the business is set up and run is of great importance. At all other occupational levels the majority of engineers express the view that this goal is of only fair importance. (See Table 47, Appendix D)

Advancing to a policy making position in management is held to be of great importance by the majority of engineers only at managerial levels 4M and 6M. Engineers at managerial level 5M, levels 1, 2, and 3, and staff levels 4S and 5S express the majority opinion that this goal is only of fair importance to them. Learning administrative methods and procedures and becoming the technical leader of a group of less experienced professionals are considered by the majority of engineers at all occupational levels to be of only fair importance. Being evaluated only on the basis of technical contributions is considered by the

majority of engineers at level 6M to be of little importance, and at all other occupational levels to be of fair importance. (See Tables 48, 49, 50, and 51, Appendix D)

Company affiliation.--Working on problems that have practical applications important to one's company and having the opportunity to help the company build its reputation as a first class organization are two goals rated by the largest proportion of engineers at all occupational levels as being of great importance to them. (See Tables 52 and 53, Appendix D)

Having the opportunity to help the company increase its profits and knowing what the goals of one's division are were both listed by all occupational levels, except one, as being of great importance. Occupational level 1 rated the former and level 3 rated the latter as being of only fair importance to them. (See Tables 54 and 55, Appendix D)

The majority of engineers at all occupational levels, except levels 1, 2, and 3, felt that working on projects that have a direct impact on the business success of their company was a very important goal. The majority of engineers at levels 1 and 2 felt this goal was of only fair importance, but at level 3, opinion was equally divided between fair and great importance. (See Table 56, Appendix D)

The majority of engineers at seven of the eight occupational levels felt that participating in decisions that set the direction of technical effort in the company was of only fair importance. Only the majority of engineers at managerial level 6M felt this goal to be of great importance. (See Table 57, Appendix D)

Participating in decisions that affect the future business of the company was thought to be of great importance by the majority of engineers at managerial levels 5M and 6M, while the greater proportion of engineers at all other levels felt this goal to be of only fair importance to them. (See Table 58, Appendix D)

Dependency goals.--The goals of having little tension and stress on the job; and few worries, tensions, and troubles were considered to be of only fair importance by the greatest proportion of engineers at all occupational levels. The goal of working in a well-ordered job situation where the requirements are clear was thought by the majority of engineers to be of fair importance at all occupational levels, except level 1

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where opinion was equally split at 46% between rating this goal as being of fair or great importance. (See Tables 59, 60, and 61, Appendix D) Also rated by the majority of engineers at most occupational levels as only fair was the importance of being given clear detailed instructions as to how to proceed with the job; the exception was at managerial level 6M where it was considered to be of little or no importance. (See Table 62, Appendix D)

Security and good life goals.--Being able to live in a location and community that is desirable to them and their families, and work in a cooperative and friendly atmosphere were both rated by the highest proportion of engineers at each occupational level as being of great importance to them. (See Tables 63 and 64, Appendix D)

The goal of having stability in one's life and work was also rated as being of great importance by four of the eight occupational levels. The majority of engineers at managerial levels 5M and 6M, and engineering level 3 felt this goal to be of only fair importance to them. Opinion was split at staff level 5S with 46% of the engineers feeling the goal to be of fair importance and 46% saying of great importance. (See Table 65, Appendix D)

Similarly, having adequate retirement, health insurance, and other company benefits was felt by the majority of engineers at five of the eight occupational levels as being of fair importance to them. Only the greater proportion of engineers at managerial levels 4M and 6M, and staff level 5S felt this goal to be of only fair importance to them. (See Table 66, Appendix D)

The most striking information here is the high percentage of engineers who feel living in a location and community desirable to them and their families is very important. Seventy-one per cent of the first engineering level feel that this goal is very important. (See Table 63, Appendix D) These engineers at level 1 are recent college graduates with little or no experience in engineering. Contrast this with their rating of the goal of making a great deal of money, where only 37% of these level 1 engineers say this goal is very important. (See Table 43, Appendix D) At all occupational levels, the importance of the goal of living in a location and community desirable to themselves and their families remains very great to the majority of engineers.

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The goal of working in a friendly cooperative atmosphere is also held to be of great importance by the majority of engineers at all occupational levels, particularly at level 1, where 83% of the engineers feel this way. At level 2 there is a slight reduction in the percentage of engineers who feel this goal to be of great importance, a reduction of 12% between levels 1 and 2, to 71%. This percentage at level 3 shows a slight increase, however falling again at staff and managerial levels where it remains relatively constant. Little difference appears to exist between the importance of this goal to managerial or staff engineers.

Also of relatively constant importance is having adequate retirement, health insurance, and other company benefits. Note that the proportion of young level 1 engineers is close to the proportion of the older higher level staff and managerial engineers who view this factor as being very important.

Stability in life and work also remains of constant importance throughout the organizational hierarchy, except for a decrease in the percentage feeling this way at managerial level 5M.

The importance of the security and good life goals appears to be quite strong among the population of engineers. It is present to a great degree at all occupational levels, both among young and older engineers, in the organization. No statistically significant difference is apparent between the staff and managerial engineer.

Autonomy.--The goals of being able to make all the decisions on matters directly concerning one's technical responsibility and be individually responsible for technical projects (rather than work with a group) are considered by the highest proportion of engineers as being of only fair importance to them. At managerial level 6M, the majority felt that the goal of being individually responsible for technical projects was of little or no importance to them. (See Tables 67 and 68, Appendix D)

Here a seeming contradiction appears. At almost every level, the percentage of engineers who attach great importance to being able to make all decisions on matters directly concerning their technical responsibility is almost twice as large as the percentage who attach great importance to being individually responsible for technical

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projects. Apparently a large percentage of engineers are interested in determining matters concerning their own technical responsibility, but are less concerned with being held responsible for a total project.

This opinion holds true on managerial levels. Only managerial level 6M shows a decrease in the difference between the percentage of engineers rating these two job factors to be important, however the difference that still exists is significant.

Note also the divergence between importance ratings for these two factors at staff levels 4S and 5S. The staff side of the organization is designed to employ those engineers who are technically oriented and desirous of engaging in technical work. However, the majority of engineersin this group attach only fair importance to being individually responsible for technical projects.

While it appears that there is a desire at all levels of the engineering organization to have a hand in decisions concerning the individual engineer's technical responsibility, it does not appear particularly strong. Even less of a desire appears to be present for responsibility for technical projects. In comparison to the goal of security and good life, the goal of autonomy seems to be of lesser importance to the engineers in this sample.

Staff position. --The highest proportion of engineers at levels 1, 2, 3, and staff levels 4S and 5S felt that advancing to a high level staff technical position was very important to them. However, the majority of managerial engineers at levels 4M, 5M, and 6M felt this goal to be only of fair importance to them. (See Table 69, Appendix D)

Power goals. --The two factors which form the power goal category have already been used in the company affiliation section of this analysis. However, the factor analysis has shown that the goals of being able to participate in decisions that affect the future business of the company and participate in decisions that set the direction of technical effort in the company are closely related and together make up the power goal category. (See Tables 57 and 59, Appendix D)

Only certain managerial levels rate power goals as being of high importance to them; all other occupational levels present a majority view of only fair importance. The majority of engineers at managerial levels 5M and 6M feel that being able to participate in decisions that

affect the future business of the company is of great importance to them. However, only at managerial level 6M, does the majority of engineers attach great importance to being able to participate in decisions that set the direction of technical effort in the company.

Summary of the Importance of Selected Personal Goals to the Engineers by Occupational Level

The above description has listed the responses of the total population of engineers to the importance of specific job factors making up selected goal categories. While it is difficult to assign weights to a particular factor in order that it might be placed higher or lower on a scale of importance in relation to another factor, it is possible to order the factors according to majority opinion at each occupational level. A hierarchy of importance according to the number of occupational levels rating a particular factor as being of great importance follows:

Goals Rated to be of Great Importance by the Majority of Engineers at All Occupational Levels

Technical Goals

1. Have the opportunity to explore new ideas about technology or systems

Company Affiliation

1. Work on problems that have practical applications important to the company
2. Have the opportunity to help the company build its reputation as a first-class organization

Security and Good Life

1. Live in a location and community that is desirable to one's self and family
2. Work in a cooperative friendly atmosphere

Additional Goals Rated to be of High Importance to:

Level 1

Technical Goals

1. Have the opportunity to work on complex technical problems
2. Work on projects that utilize the latest theoretical results in

one's specialty
3. Work on projects that require learning new technical knowledge
4. Work with others who are outstanding in their technical achievement

Monetary

1. Receive better-than-average salary increases

Company Affiliation

1. Know what the goals of one's division are

Security and Good Life

1. Have stability in life and work

Staff Position

1. Advance to a high level staff technical position

Level 2

Technical

1. Have the opportunity to work on complex technical problems

Managerial

1. Become a first-line manager in one's line of work

Company Affiliation

1. Have the opportunity to help the company increase its profits
2. Know what the goals of one's division are

Security and Good Life

1. Have stability in life and work

Staff Position

1. Advance to a high level staff position

Level 3

Technical

1. Have the opportunity to work on complex technical problems
2. Work on projects that require learning new technical knowledge
3. Work with others who are outstanding in their technical fields

Managerial

1. Become a first-line manager in one's line of work

Security and Good Life

1. Have adequate retirement, health insurance, and other company benefits
2. Have stability in life and work

Staff Position

1. Advance to a high level staff technical position

Staff Level 4S

Technical

1. Have the opportunity to work on complex technical problems

Company Affiliation

1. Work on projects that have a direct impact on the business success of the company
2. Have the opportunity to help the company increase its profits
3. Know what the goals of your division are

Security and Good Life

1. Have adequate retirement, health insurance, and other company benefits
2. Have stability in life and work

Staff Position

1. Advance to a high level staff technical position

Staff Level 5S

Technical

1. Have the opportunity to work on complex technical problems
2. Work with others who are outstanding in their technical achievements

Monetary

1. Receive better-than-average salary increases

Company Affiliation

1. Work on projects that have a direct impact on the business

success of the company
2. Have the opportunity to help the company increase its profits
3. Know what the goals of one's division are

Security and Good Life

1. Have adequate retirement, health insurance, and other company benefits
2. Have stability in life and work

Staff Position

1. Advance to a high level staff technical position

Managerial Level 4M

Monetary

1. Make more money than the "average" college graduate
2. Receive better-than-average salary increases

Managerial

1. Become a first-line manager in one's line of work
2. Advance to a policy making position in management
3. Learn how the business is set up and run

Company Affiliation

1. Work on projects that have a direct impact on the business success of the company
2. Have the opportunity to help the company increase its profits
3. Know what the goals of one's division are

Security and Good Life

1. Have adequate retirement, health insurance, and other company benefits
2. Have stability in life and work

Managerial Level 5M

Monetary

1. Receive better-than-average salary increases

Managerial

1. Become a first-line manager in one's line of work
2. Learn how the business is set up and run

Company

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Company Affiliation

1. Work on projects that have a direct impact on the business success of the company
2. Have the opportunity to help the company increase its profits
3. Participate in decisions that affect the future business of the company
4. Know what the goals of one's division are

Power Goals

1. Participate in decisions that affect the future business of the company

Managerial Level 6M

Monetary

1. Make more money than the "average" college graduate
2. Receive better-than-average salary increases

Managerial

1. Become a first-line manager in one's line of work
2. Advance to a policy-making position in management
3. Learn how the business is set up and run

Company Affiliation

1. Work on projects that have a direct impact on the business success of the company
2. Have the opportunity to help the company increase its profits
3. Participate in decisions that affect the future business of the company
4. Participate in decisions that set the direction of technical effort in the company
5. Know what the goals of one's division are

Security and Good Life

1. Have adequate retirement, health insurance, and other company benefits
2. Have stability in life and work

Power Goals

1. Participate in decisions that affect the future business of the company
2. Participate in decisions that set the direction of technical effort in the company

Differences Between the Goals of the Prefer More and Right Amount of Work Engineers

In the above sections, the important goals of the total engineering population were considered by occupational level to better understand the goal structure of the engineers in this organization. In the following sections, the occupational grouping will be maintained. However, each occupational level will be further subdivided into groups according to work preference.

The objective is to determine what characteristics distinguish the prefer more engineers, therefore, attention will be centered on a comparison of the prefer more and right amount of work engineers' responses.

Only differences that occur between the responses of the prefer more and right amount engineers will be discussed here. Where no differences are pointed out, no significant differences exist between the importance attached to a particular goal by the prefer more and right amount engineers.

The greatest differences between responses of the prefer more and the right amount engineers concern, managerial, company affiliation, and power goals.

At every occupational level, the prefer more engineers attached more importance to the following goals, than did the right amount of work engineers. Tables listed are in Appendix D.

Managerial Goals

1. Become a first-line manager in one's line of work* Table 46
2. Advance to a policy making position in management Table 48
3. Be the technical leader of a group of less experienced professionals Table 50
4. Learn how the business is set up and run* Table 47

*Exclusive of managerial level 5M

Company Affiliation

1. Work on projects that have a direct impact on the business success of the company Table 56
2. Have the opportunity to help the company increase its profits Table 54
3. Participate in decisions that set the direction of technical effort in the company Table 57

4. Participate in decisions that affect the future business of the company Table 58
5. Know what the goals of one's division are* Table 55

*Exclusive of managerial level 5M

Staff Position

1. Advance to a high level staff technical position* Table 69

*Exclusive of level 3

Power Goals

1. Participate in decisions that set the direction of technical effort in the company Table 57
2. Participate in decisions that affect the future business of the company Table 58

Summary of Differences in Goal Importance Between Prefer More and Right Amount Engineers

The responses of the prefer more engineers were not significantly different from those of the right amount engineers for most goal categories. Scientific, technical, monetary, dependency, security and good life, and autonomy goals evoked more or less the same responses from the prefer more and the right amount of work engineers.

The similarities between the two work preference groups of engineers in responses to technical goals is particularly noteworthy.

In the previous chapter, the findings indicated that the prefer more engineer was more dissatisfied with his technical utilization. The responses from the prefer more engineers indicated higher feelings of poor technical utilization. The prefer more engineers also indicated that the intellectual demands made on them by their work was light and they had less opportunity to utilize their technical abilities to their fullest extent.

In order to explain the above responses of higher feelings of poor technical utilization for the prefer more engineers, it was hypothesized that the prefer more engineer attaches greater importance to scientific and technical goals than does the right amount of work engineer. This has not proved to be the case. The prefer more engineers did not attach any more importance to scientific and technical goals than did the

right amount of work engineers. The hypothesis has not been substantiated.

The greatest differences in importance ratings were concerned with managerial goals and organizationally oriented goals, such as advancing to a policy making position in management, working on projects that have a direct impact on the business success of one's company, and participating in decisions that affect the future business of the company. A larger proportion of the prefer more than right amount engineers rated these goals as being important, at every occupational level.

One goal rated by more of the prefer more engineers as being important -- participating in decisions that set the direction of technical effort in the company (See Table 57, Appendix D) -- may seem to indicate an attachment of higher importance to a goal dealing with technical qualities of the work situation. However, if the meaning of this response of the prefer more engineers is to be interpreted, it should be compared with the responses of the prefer more engineers toward the importance of making all the decisions on matters directly concerning their technical responsibility. (See Table 67, Appendix D)

The first goal deals with setting the direction of technical effort for the company -- for a large group of engineers including the engineer respondent. The second deals with the technical responsibility of the individual engineer alone.

It can be seen in Table 67, Appendix D, which lists the importance attached to the goal of being able to make all the decisions on matters directly concerning one's technical responsibility, that the prefer more engineers attach greater importance to this goal. At every level, except levels 6M and 5S, a greater proportion of the prefer more than right amount engineers rate this goal as being of great importance to them.

Considering the goal of being able to participate in decisions that set the direction of technical effort in the company, (Table 57, Appendix D) it can be seen that at each occupational level a higher percentage of the prefer more engineers feel this goal to be of great importance.

From this evidence, it appears that while the prefer more engineers feel it is important to make decisions concerning their individual

technical responsibility, they attach even more importance to being able to make decisions concerning the overall technical effort of the company. Their technical interest appears to be more in the direction of management of the technical process than toward the individual engineer's technical responsibility.

The prefer more engineers, in general, have a larger proportion of individuals who attach great importance to advancing to a high level staff technical position. (See Table 69, Appendix D) This is true even at managerial levels 4M, 5M, and 6M. This view and the importance the prefer more engineers attach to being able to make decisions concerning the overall technical effort of the company tend to support the earlier findings, which indicate that the prefer more engineers' interest in the technical features of their job is directed more toward managing these features, than toward actually doing technical work.

Further, the proportion of prefer more engineers who attach higher importance to the goal of advancing to a high level staff technical position is either greater, or more skewed in the higher importance direction, at every occupational level except level 3. It should be remembered that it is at level 3 where the engineer is either promoted to a staff or a managerial position. The fact that lower percentages of prefer more engineers at level 3 feel that advancing to a high level staff technical position is important to them would tend to further substantiate the hypothesis that the prefer more engineer is primarily interested in a managerial position if he can get it.

Summary

In this chapter the hierarchy of goals held by the engineers in this study was presented. It was shown that the goals held to be of great importance by the majority of engineers at all occupational levels were certain technical, company affiliation, and security and good life goals. Goals making up the scientific, monetary, managerial, dependency, autonomy, staff position, and power goal categories were not considered by the majority of engineers at all occupational levels as being of great importance. However, when each occupational level is considered separately, at each level some of the same goals, and some different goals are considered to be of great importance by the majority

of engineers at each level. This is a further example of the existence of perspectives peculiar to particular occupational levels.

The major differences between the responses of the prefer more and the right amount of work engineers which occur in certain goal categories were also analyzed. These categories in which the greatest difference occurs, are made up of goal factors which tend to be managerial or organizational in nature. It was shown that the prefer more engineers tended to attach greater importance to these managerially associated goals.

The original hypothesis that the prefer more work engineer attached greater importance to scientific and technical goals and hence desired higher level technical work for this reason proved to be incorrect. Rather than attaching a higher importance to scientific and technical goals, the prefer more engineer attached greater importance to managerial and organizationally oriented goals.

In the next chapter, further verification of the managerial orientation of the prefer more engineers is sought in an examination of their objectives of further education.

CHAPTER V

ENGINEERS' OBJECTIVES OF FURTHER EDUCATION

In the last chapter, it was shown that the original hypothesis that the prefer more engineer desired higher level technical work because he attached greater importance to technical goals was incorrect. Rather, the prefer more engineer attached more importance to goals of a managerial nature than to technical goals. This chapter will examine another measure of the engineer's organizational orientation; his objectives in further education and the degree to which specific types of coursework meet his aims.

Education has been called the "royal road to success."[1] If education is a road leading to success, then success is a position that is aspired to and not now occupied. Education can be viewed as training toward a particular goal. Continued education is the training to achieve a goal for which the engineer's previous education has not provided full resources. Therefore, asking engineers to rate the importance of certain objectives in additional education and the desirability of certain coursework will provide an indication of the direction of their aspirations and the goals included in their concepts of success.

By examining the prefer more engineers' objectives of further education, and comparing them with those of the right amount engineers, further insight into the goal structure of the prefer more engineers will be achieved.

The past chapter has shown that the prefer more engineer tends to attach greater importance to managerial and organizational goals than does the right amount of work engineer. This chapter examines the differences between the importance prefer more and right amount engineers attach to selected objectives in their further education. Also

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[1] W. Lloyd Warner and James C. Abegglen, Big Business Leaders in America, New York: Athenum, 1963, p. 34.

examined are differences in the type of coursework which the prefer more and right amount engineers feel best meets their needs.

A pattern of organizational goal orientation was determined for the prefer more engineers in the last chapter. If this pattern continues, it should be found here that the prefer more engineers attach greater importance to managerial and organizational objectives in further education and feel more strongly than the right amount engineers that coursework dealing with managerial skills and organizational matters best meets their aims.

The same operational procedure is followed in this section as in earlier sections. The population of engineers was divided by occupational level and then further subdivided according to feelings about the amount of work they are asked to perform. The right amount and prefer more engineers are examined and compared to assess any differences in their ratings of various educational variables.

The population of engineers was asked questions concerned with rating eight objectives in receiving further education. The eight educational objectives investigated were: to prepare for increased technical responsibility, to remedy deficiencies in initial training, to obtain a position in management, to obtain an advanced degree, to perform one's present assignment better, to keep from becoming obsolete, because the engineer's manager expects additional coursework, and to become an authority in a field of specialty.

The engineer was asked to rate the importance of each objective on a scale from zero to ten, with zero meaning of no importance and ten meaning of utmost importance to him. As in earlier sections, the zero to ten scale was reduced to a scale of three. The value of one meaning of no importance and the value of three meaning of great importance. The engineers' responses to this series of questions on education are tabulated and presented in Appendix E. These responses are reviewed and discussed in the following sections.

To prepare for increased technical responsibility (See Table 70, Appendix E).--The majority of right amount engineers at all levels but 5M and 6M rate the educational objective of preparing themselves for increased technical responsibility as being of great importance. The highest percentages feeling this way, 83% and 81%, occur at level 1

and staff level 5S. However, the low of 55% occurs at staff level 4S. Engineers at managerial levels 5M and 6M rate the importance of this objective lower, with only 41% at level 5M and 30% at level 6M feeling this objective to be of great importance. At these managerial levels, the right amount engineers tend to take a middle of the road attitude toward this objective, with the majority at managerial levels 5M and 6M feeling this objective to be of fair importance.

Those engineers who prefer more work evidence larger percentages at levels 2, 3, 4S, and 4M who feel that this objective is of great importance. At level 5S, the prefer more engineers feel that this objective is of lesser importance than do the right amount of work engineers. Eighty-one per cent of the right amount engineers, as opposed to only 46% of the prefer more engineers, feel this objective is of great importance. Eight per cent of the prefer more engineers feel this objective to be of little importance, while none of the right amount engineers feel this way.

The divergence in responses between the prefer more and the right amount engineers at staff level 5S is particularly interesting since one would expect most staff engineers to be interested in taking on increased technical responsibilities. While this appears to be true for the right amount engineers, it does not seem to be true for the prefer more engineers. Since the prefer more engineers demonstrate a lower percentage who feel this goal is important, it appears that success as defined by the prefer more engineers at this occupational level may not contain increased technical responsibilities to any large degree.

At the managerial levels, the prefer more engineers have the greatest percentage of engineers who feel this objective to be of little importance to them, with 13% at level 5M and 6M. The majority of engineers, however, feel that this objective is of fair importance to them.

To remedy deficiencies in initial training (See Table 71, Appendix E). - - The majority of right amount engineers at all occupational levels express the opinion that remedying deficiencies in initial training is of only fair importance to them. At least 62% of the right amount engineers at all levels feel that this objective is of fair importance or no importance to them. The prefer more engineers evidence a slightly

greater concern for this objective.

At all levels, except staff level 5S, higher percentages of prefer more than right amount engineers feel this objective to be of great importance. However, at the same time, at most occupational levels, higher percentages of prefer more than right amount engineers feel this objective to be of little importance. The prefer more engineers appear to be given to greater extremes in opinion toward this objective.

The extremes of opinion which the prefer more engineers evidence might be explained by the broadness of the question. The term "deficiencies" is not precisely defined and may mean different things to different engineers. For example, it can be taken to mean technical deficiencies or it could mean managerial deficiencies. If the prefer more engineer is assumed to be more managerially oriented and interested in developing managerial abilities, he may interpret deficiencies as meaning technical deficiencies and rate these as being of little importance to him. This could account for the high percentage who rated the factor as being of little importance. However, if the prefer more engineer views deficiencies as meaning deficiencies in managerial training which he did not receive in his initial training, then he might rate this objective to be of great importance to him, which would explain the higher percentage in this category. To investigate this point further, consider the next educational objective of preparing for a position in management.

To help prepare for a position in management (See Table 72, Appendix E).--Except at level 4M, the majority of right amount engineers at all occupational levels assign only fair importance to the objective of preparing for a position in management. Percentages range from 42% at managerial level 5M to 58% at staff level 5S. At level 4M, opinion is split between fair and great importance at 47% and 48%. Except at level 4M, the percentages of right amount engineers feeling this objective to be of high importance are below 39% for all occupational levels.

However, at all occupational levels, the prefer more engineers exhibit higher percentages who feel the educational objective of preparing for a position in managementto be of great importance, than do the right amount engineers.

Changes in percentages of engineers rating the objective of preparing for a position in management as being of great importance at staff levels 4S and 5S are of interest. At staff level 4S, 26% of the right amount engineers feel this objective to be important. However, at level 5S, the percentage has fallen to 12%. On the other hand, the percentages of prefer more engineers who feel this objective to be important are 27% at level 4S and 31% at level 5S. Not a particularly significant percentage increase, but, a significant change when it is considered that this is the opinion of technical staff professional engineers.

Apparently, of the prefer more engineers at staff level 5S, almost one-third feel that greater opportunities for advancement lie outside of the staff role and in the managerial realm. What would cause this difference in opinion between levels 4S and 5S?

At staff level 4S, some opportunities exist, though they are few, for promotion to level 5S, so the need for managerial preparation may not appear so necessary. However, as chances of of further promotion from level 5S on the staff professional side are almost non-existent, more emphasis may be placed on managerial training by the prefer more engineers in order to qualify for a lateral promotion to management. Unfortunately, the view taken by the right amount engineer may be the more realistic one, as little lateral mobility takes place between staff and managerial sides of the dual ladder.

On the other hand, personnel at level 6M, the highest managerial level in this study, have the opportunity to go higher in the managerial hierarchy. At this occupational level, 75% of the prefer more engineers feel that the educational objective of preparing for a position in management is of great importance compared with only 25% of the right amount engineers feeling this way.

To obtain an advanced degree (or a bachelor's degree) (See Table 73, Appendix E).--The percentage of right amount engineers who feel the objective of obtaining an advanced degree is of great importance is quite small at most occupational levels, with percentages ranging from 50% at level 1, to zero at staff level 5S. The range of percentages of prefer more engineers who feel this to be an objective of great importance varies more widely, from 93% at level 1, to 13% at managerial

levels 5M and 6M, and to zero at staff level 5S. None of the engineers in any work preference category at staff level 5S feel this educational objective to be of great importance. At level 5S, the majority of the right amount engineers feels this objective to be of fair importance, while the majority of the prefer more engineers views this objective as being of little or no importance.

Consider the data contained in Table 20, Appendix B, which lists the educational attainments of the engineers by occupational level and work preference. At level 1, all engineers have at least a bachelor's degree, 17% of the right amount and 7% of the prefer more engineers possess a master's degree. At staff level 5S, 62% of the right amount and 20% of the prefer more engineers hold a master's or a Ph.D. degree. The low percentage at level 5S and the high percentage at level 1 of engineers who feel that obtaining an advanced degree is of great importance may be explained by considering that those who desire an advanced degree already may have it at level 5S, while the younger engineers at level 1 still aspire to further education.

To perform the engineer's present assignment better (See Table 74, Appendix E).--Percentages of the right amount engineers at each occupational level who feel that education to perform their present assignment better is an objective of great importance range from a low of 35% at managerial level 6M to a high of 57% at staff level 4S.

Percentages of the prefer more engineers who feel this objective to be of great importance are larger than or equal to the percentages of right amount engineers who feel this way at all by the staff levels 4S and 5S. For the prefer more engineers who consider this objective to be of great importance, percentages range from a low of 36% at staff level 4S to a high of 57% at managerial level 4M.

At the professional staff levels, 4S and 5S, the percentages of the prefer more and right amount engineers who feel this objective to be important are, respectively, 43% and 52% for level 5S, and 36% and 57% for level 4S.

Consider what the educational objective of further education to perform the engineer's present job better may actually mean to the engineer. Responses to this question may be taken to indicate attitudes toward the engineer's present assignment. A response of felt import-

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ance toward this educational objective could be taken to indicate a degree of satisfaction with the content of the present assignment and the engineer's desire to continue with similar content in future assignments. This can be taken to mean that the engineer is satisfied with his role in his present assignment and his idea of success includes this type of role. On the other hand, a response of low importance for the engineer toward this educational objective can be taken to indicate that the engineer's idea of success may not include the content of his present assignment.

With this point of view in mind, consider again Table 74, Appendix E. In earlier sections of this study, the prefer more engineers were shown not to be satisfied with their advancement and interested in maximum mobility and achievement.

At staff professional levels 4S and 5S, the prefer more engineers have a lower percentage of individuals who feel that further education to perform their present assignment better is of great importance. This would indicate that the success to which the prefer more engineer at these occupational levels aspires through further education may not contain work content similar to that of their present job assignment.

On the other hand, the situation is reversed for managerial levels 4M, 5M, and 6M. The percentages of engineers who find this objective to be of great importance are always greater among the prefer more engineers than they are among the right amount engineers. Apparently, in this case, the success aspired to by further education does contain work similar to the present job assignment which is of a managerial nature.

To keep from becoming obsolete (See Table 75, Appendix E).--At all occupational levels, except managerial level 6M, the percentage in the majority for the right amount engineers feels that continuing education to keep from becoming obsolete is an educational objective of great importance. Percentages range from a low of 40% at managerial level 6M to a high of 79% at staff level 5S. The majority of right amount engineers at level 6M believe this objective to be of fair importance, with a percentage of 55% feeling this way.

For the prefer more engineers, the percentages who say this objective is of great importance at all occupational levels, except at level

1, are larger than those of the right amount engineers who feel this way. Percentages range from 50% at managerial level 6M to 81% at engineering level 2.

The prefer more engineers appear to be even more concerned with obsolescence than do the right amount engineers.

Because the engineer's manager expects his people to take additional coursework (See Table 76, Appendix E).--The objective of taking additional coursework because their manager expects it appears to be of little importance to the engineer. Neither the prefer more nor the right amount engineers, at any occupational level, responded with any significant percentages indicating they felt continuing education was of great importance because their managers expect them to take additional coursework. The majority of engineers at all occupational levels, except the right amount engineers at levels 1 and 2, felt this objective in continuing education was of little or no importance.

There would appear to be little direct pressure within the organization to take additional coursework.

To enable the engineer to become an authority in his field of specialty (See Table 77, Appendix E).--Percentages of engineers attaching great importance to the objective of becoming an authority in a particular field of specialty is highest, for both work preference groups, at level 1, with 44% of the right amount and 60% of the prefer more engineers stating that this objective is of great importance to them. Importance of this objective follows a downward trend as higher occupational levels are examined. From the high at level 1, the lowest percentages are reached at the managerial levels.

Apparently there is a different outlook at different occupational levels. At the lower occupational levels, those who prefer more are more eager to become an authority in their field of specialty than are those who feel they have the right amount of work. For the prefer more engineers who feel this objective to be of great importance, percentages range from a high of 60% at engineering level 1 to a low of 9% at managerial level 5M. At higher occupational levels, both staff and managerial, percentages of those who prefer more are less than those of the right amount engineers who attach great importance to learning more about their specialty. At the lower occupational levels of engineering,

there appears to be greater drive toward learning more about the engineer's technical specialty.

The responses to this question may further illustrate that different perspectives exist at different occupational levels. If we assume that the engineers at a given occupational level share a certain perspective, the different responses at the different occupational levels illustrate a change in the engineer's perspective and in his motivation to prefer more work.

For example, at lower engineering levels, the engineer may feel that the road to success is to become an expert in his engineering specialty. However, as the engineer reaches higher occupational levels within the organization, it may become more apparent to him that technical abilities alone will not lead to the greatest amount of upward mobility, as managerial abilities are becoming more important. Sights are then changed. The achievers -- the prefer more engineers -- now feel they must learn skills other than technical ones if they are to become as upwardly mobile as possible. This assumption appears to be substantiated as the percentage of engineers who attach importance to becoming an authority in their field of specialty can be seen to diminish as higher occupational levels are examined.

Summary of Engineer's Educational Objectives

A summary of the objectives engineers seek in additional education or training is presented in the following sections. The procedure followed is to consider first the engineers who feel they have the right amount of work. Then, the engineers who prefer more work will be compared with the right amount of work engineers to determine if any significant differences exist with regard to the importance of the objectives of further education investigated.

Objectives of Additional Education as Viewed by the Right Amount Engineers

The population of engineers was asked to rate the importance of eight objectives that could be reached with additional education or training, with reference to the importance of the objectives to the individual engineer.

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The one objective of additional education that was rated as being most important by the right amount engineers is to keep from becoming obsolete.[1]

The following comment was made by a professional in industry:

> Ten or 15 years ago, some of us were pioneering new fields, especially electronics. But so much emphasis has been placed on these fields that now young men just coming in often know as much or more than the pioneers.
>
> The days seem to be over when a person could sit back once he had his degree or degrees and devote himself to his chosen career. Now, education, on a formal classroom basis, is becoming an almost lifelong process for the highly educated.[2]

This opinion seems to dominate all levels of the engineering organization. From the first level upward to managerial engineering levels, the objective of additional education to keep from becoming obsolete is considered to be of great importance by the majority of all right amount engineers, except those at managerial level 6M.

Another important objective to the right amount engineer in this study of additional education is preparing for increased technical responsibilities. The importance of this objective seems to diminish somewhat only at the uppermost managerial levels, but even here 95% or more of the engineers at the managerial levels feel this objective to be of importance.

The next most important objective on the hierarchy of importance of objectives in additional education is preparing for a position in management. The majority of right amount engineers at all occupational levels felt this objective to be at least of fair importance to them. At managerial level 4M, the majority felt this objective was of great importance to them, with only 5% feeling this objective had little or no importance.

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[1] For a discussion of obsolescence and a categorization of the different types of obsolescence an engineer may experience, see: Theodore N. Ferdinand, "On the Obsolescence of Scientists and Engineers," American Scientist, March 1966, Volume 54, Number 1, pp. 46-56.

[2] G. Subak-Sharpe, "Scientists Fighting Obsolescence by Going to School at 40," The New York Times, January 12, 1966, p. 48.

The objective of additional education to perform their present assignment better was rated by the majority of engineers at occupational levels 2 and 6M as being of fair importance with the majority of engineers at all other occupational levels feeling this objective to be of great importance.

Theobjective of becoming an authority in their field of specialty was rated as being of fair importance by the majority of right amount engineers, except at level 1, where the majority felt that this objective was of great importance.

Additional education to remedy deficiencies in initial training was rated as being of only medium importance as an educational objective by the majority of right amount engineers at every occupational level.

The objective of obtaining an advanced degree (or a bachelor's degree) showed the greatest number of differing attitudes at various occupational levels. The majority of right amount engineers at levels 2, 3, staff level 5S, and managerial level 4M felt this educational objective to be of fair importance. However, the largest number of right amount engineers at staff level 4S and managerial levels 5M and 6M felt this objective to be of little or no importance to them. Only the majority of right amount engineers at level 1 felt the objectives to be of great importance.

For right amount engineers at most occupational levels, except for level 1 and 2, the majority percentage felt that the educational objective of taking additional coursework because their managers expect their people to take additional coursework was of little or no importance to them. At levels 1 and 2, the majority felt this objective to be of only fair importance to them, with 94% of level 1, and 99% of level 2 engineers feeling this objective to be, at most, either of little or fair importance to them. At both levels 1 and 2, 44% of the engineers felt that this objective is of little or no importance to them.

The Hierarchy of Educational Objectives for the Right Amount of Work Engineers

Earlier in this study, the existence of particular attitudes at a particular occupational level were pointed out. In this section on

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objectives in attaining additional education, differences can be seen between the responses of the engineers at different occupational levels. The differences between the majority opinion at each occupational level will be used in setting up a hierarchy of educational objectives for the right amount of work engineers.

As differences between occupational levels concerning the importance of educational objectives have been examined in the above sections, these educational objectives are now summarized in a general hierarchy of importance.

The factor that is considered to be of great importance by the largest number of occupational levels will be considered to be of greatest importance to the total right amount group of engineers. The factor considered to be of little or no importance by the most occupational levels will be considered to be the one of least importance. Factors which fall in between these two extremes will be placed somewhere in the continuum.

Following this methodology, the hierarchy of importance of objectives in additional education for the right amount engineers becomes, in order of decreasing importance, :

1. To keep from becoming obsolete
2. To prepare for increased technical responsibilities
3. To perform one's present assignment better
4. To enable one to become an authority in one's field
5. To help prepare for a position in management
6. To remedy deficiencies in initial training
7. To obtain an advanced degree (or a bachelor's degree)
8. Because one's manager expects his people to take additional coursework

Differences Between the Responses of the Prefer More and Right Amount Engineers Toward the Importance of Objectives of Additional Education

This section will investigate what differences exist in the importance of objectives of additional education as expressed by the prefer more and right amount engineers.

A word about statistical significance is in order here. While the differences between the responses of the prefer more and the right amount engineers are, in most cases, not significant to a high degree of confidence, the direction of emphasis is significant. Many complicating

factors are at work to reduce the degree of differences between responses from the two groups, especially pressures in the organizational environment which tend to create a common value system among engineers in both groups. There cannot, therefore, be expected too marked a polarization of a particular viewpoint in any one group over another. However, if concern is directed toward frequency trends, rather than toward the question of the magnitude of the differences, certain patterns can be perceived.

For example, in the following analysis concerning the educational objective of preparing for a position in management, (See Table 72, Appendix E) at every occupational level a larger proportion of the prefer more engineers than right amount engineers stated that this objective was of great importance to them.

To have a pattern repeated eight times out of eight is exceedingly statistically significant. It is on this basis that the following analysis is conducted -- in terms of direction of emphasis rather than in absolute differences.

Those engineers who prefer more show a greater interest in management positions at all occupational levels. A larger proportion felt that the objective of preparing for a position in management was of great importance to them. This emphasis was particularly evident at managerial level 6M, where 75% of the prefer more engineers felt this goal to be of great importance to them, while only 25% of the right amount group felt this way.

However, while the prefer more engineers are more interested in preparing for a managerial position, they appear to be less influenced by any pressure that may be placed on them by their own managers to take additional coursework.

A larger proportion of those who prefer more feel it is of little or no importance to take additional coursework because their manager expects his people to take additional coursework. At every occupational level, except level 3, and staff level 5S, a larger proportion of those who prefer more feel that this objective is of little or no importance to them. This attitude is emphasized at levels 1 and 2 where the majority of right amount engineers feel that this objective is of fair importance, while the majority of prefer more engineers at these

levels feel that this objective is of little or no importance to them.

Considering now technical ambitions as opposed to managerial ambitions and consider the objective of preparing for increased technical responsibilities.

At level 2, 3, staff level 4S, and managerial levels 4M and 6M, the prefer more engineers have larger proportions who feel the educational objective of preparing for increased technical responsibilities is of great importance to them.

The difference at staff level 5S is of particular interest. It is of note that the prefer more engineers, the engineers who are interested in high achievement, should feel less strongly about the importance of preparing themselves for increased technical responsibilities, since this is normally considered to be the work of a staff professional.

This may be explained if it is assumed that the prefer more group contains a larger proportion of engineers who are interested in managerial work. It should be remembered that a larger proportion of the prefer more than the right amount of work engineers rated preparing for a position in management as being of great importance. This viewpoint is further substantiated by considering the managerial levels 5M and 6M where a smaller proportion of prefer more engineers, still, however, the majority opinion, feel that preparing for increased technical responsibilities is only of fair importance to them.

The prefer more engineer's response to the importance of this objective at managerial level 4M is still left largely unexplained. Here the prefer more engineers show a slightly larger proportion who feel that preparing for increased technical responsibilities is of great importance to them.

Nevertheless, the view that the prefer more group contains engineers who are interested in managerial duties can be further substantiated by considering the responses of the prefer more and right amount engineers concerning the educational objective of further education to perform one's present assignment better.

For example, considering staff levels 4S and 5S, the prefer more engineers in both cases have lower percentages who feel that further education to perform their present assignment better is of great importance to them. In fact, at level 4S, while the majority opinion of the

right amount engineers is that this objective is of great importance to them, the prefer more engineers' majority opinion is that this objective is only of fair importance. A similar situation exists at staff level 5S.

Considering now the responses of the engineers at managerial levels 4M, 5M, and 6M on the same educational objective, the majority of the prefer more engineers attach great importance to this objective. However, at the same managerial levels, lower percentages of right amount engineers are of the opinion that further education in order to perform their present assignment better is of great importance to them.

If the prefer more engineers are considered as a whole combining staff and managerial levels, the evidence at hand would indicate that the prefer more engineers are more interested in performing tasks of a managerial nature than they are in performing a staff professional role. In other words, the prefer more engineers tend to have a higher level of interest in managerial work than do the right amount of work engineers.

Coursework that Meets the Engineers' Aims

Now that the degree of importance attached to certain educational objectives by the engineers has been examined, let us concern ourselves with the types of study the engineers feel would be most in line with their aims.

The engineers were asked if they took additional coursework, what types of study would be most in line with their aims. Nine types of study were presented for their rating: about the Corporation and its organization, dealing with the engineer's field, dealing with general science outside the engineer's field, directed specifically at the engineer's specialty, dealing with general topics in the social sciences, improving knowledge of economics and business matters, broadening appreciation of art and literature, concerning management skills and dealing with others, and about company products and systems.

The engineers' responses to the degree to which each type of study meets their aims are tabulated and presented in Appendix E.

The same procedure is followed that has been followed in the previous sections, however, here a measure is taken of the degree to which

aims of the engineer are met by particular types of study rather than the importance attached to a particular objective in additional education.

The engineers were asked to rate the degree to which a particular type of study is in line with their aims on a scale from zero to ten. Zero meaning that the type of study did not meet the engineer's aims at all and ten meaning that this type of study met his aims exactly. The zero to ten scale was reduced to a scale of three in the same manner as in earlier sections. The value of one meaning aims are poorly met, two meaning aims are fairly well met, and three meaning aims are greatly met by the type of study.

The following is a summary and discussion of the engineers' responses toward the particular types of coursework investigated.

Coursework about the Corporation and its organization (See Table 78, Appendix E).--Percentages of right amount engineers viewing the study of the Corporation and its organization as meeting their aims to a great degree ranges from 24% at level 4M to 2% at level 4S. For the prefer more engineers, percentages range from 26% at level 3 and managerial level 4M, to zero at managerial level 6M.

Percentages are quite low for both the right amount and prefer more engineers who feel their aims are met to a great degree by this type of study. The percentage majority for both work preference groups at all occupational levels, except at level 1 and of the prefer more engineers at level 3, feel their aims are only fairly met by this type of study. At level 1 the percentage majority for both work preference groups, and the majority of prefer more engineers at level 3, find study about the Corporation and its organization meets their aims to little or no extent.

Dealing with the engineer's field (electrical engr., mechanical engr., etc.) (See Table 79, Appendix E).--The percentage majority of both prefer more and right amount engineers at most occupational levels, exclusive of the managerial levels and prefer more engineers at staff level 4S, feel this type of study meets their aims to a great extent. Percentages of right amount engineers feeling this way range from 94% at level 1, to 53% at staff level 4S. The managerial engineers at levels 4M, 5M, and 6M feel this type of study meets their aims only fairly well. Percentages of the right amount engineers who feel this

way are 50% at level 5M and 56% and 68% at level 4M and 6M, respectively.

Except at levels 2, 4M, and 5M, the prefer more engineers exhibit smaller proportions of individuals who feel this type of study meets their aims to a great extent. The percentages of prefer more engineers who feel their aims will be greatly met by this type of study range from 87% at level 1 to 13% at managerial level 6M.

At the managerial levels, the majority of the prefer more engineers feel study dealing with their field will only fairly well meet their aims. At staff level 4S, the majority percentage of the prefer more engineers, 55%, says this type of study meets their aims only fairly well, while 53% of the right amount engineers at this level view their aims as being met to a great extent by this type of study.

Coursework dealing with general science outside the engineer's field (See Table 80, Appendix E).--Response was relatively low for this type of study meeting the aims of the engineers to a great extent. Percentages of right amount engineers who felt study dealing with general science outside their field met their aims ranged from 38% at staff level 5S to 5% at managerial level 6M.

Except at levels 5S and 6M, the prefer more engineers exhibited slightly larger percentages than those of the right amount engineers who felt this study met their aims to a great extent. Percentages of the prefer more engineers who feel study of this nature meets their aims range from 38% at level 2, to zero at level 6M.

The majority percentage of both work preference groups at almost all occupational levels feel that this type of study meets their aims only fairly well. The only exception is at level 2, where the opinion of the prefer more engineers is about equally distributed between not meeting aims and greatly meeting aims.

Coursework directed specifically at the engineer's specialty (feedback control, magnetics, statistics, etc.) (See Table 81, Appendix E).--Only at levels 1, 3, and 4S do the majority of right amount engineers feel that study directed specifically at their specialty greatly meets their aims, with 67%, 49%, and 49%, respectively, feeling this way. At all other occupational levels, the majority of right amount engineers feel this type of study meets their aims only fairly well.

Percentages feeling this way range from 63% at level 6M to 48% at level 5M.

At level 1, while the majority of right amount engineers, 67%, felt that study of this type meets their aims, only 33% of the prefer more engineers feel this same way. The greatest percentage of the prefer more engineers at level 1, 60%, feel study of this type meets their aims only fairly well.

At all levels, except engineering level 3, staff level 4S, and managerial level 6M, the majority of the prefer more engineers felt that study directed specifically at their specialty only met their aims fairly well. Of the prefer more engineers at level 3, 4S, and 6M, the majority percentages felt that this type of study met their aims to a great extent.

Coursework dealing with general topics in the social sciences (psychology, sociology, etc.) (See Table 82, Appendix E).--Very small percentages of engineers at all occupational levels felt study dealing with general topics in the social sciences met their aims to a great extent. Percentages of right amount engineers who felt this type of study met their aims to a great extent ranged from zero at levels 1 and 4S, to 14% at level 5M. The prefer more engineers exhibited higher percentages who felt this type of study met their aims with percentages ranging from 25% at managerial level 6M to 7% at level 1.

The percentage majority of right amount engineers at all occupational levels felt that study of general topics in the social sciences met their aims only to a fair degree. Percentages range from 73% at level 2, to 52% at level 5M. The same relative percentages occurred for the prefer more engineers at almost all occupational levels except at levels 1 and 2, where 50%, the majority, felt that study of this type met their aims to little or no extent.

Coursework directed at improving knowledge of economics and business matters (See Table 83, Appendix E).--At all occupational levels, the majority of right amount engineers felt that studies directed at improving knowledge of economics and business matters met their aims to only a fair degree. This opinion was expressed by a high of 75% at staff level 4S and a low of 50% of the right amount engineers at levels 1, 5M, and 6M.

Of the prefer more engineers, the majority felt this type of study met their aims only fairly well. This was true of all occupational levels except level 1, where the majority of 47% felt study of this type met their aims to little or no extent.

At every occupational level, except managerial level 5M, the prefer more engineers exhibited higher percentages than did the right amount engineers who felt this type of study greatly met their aims. The differences between the two responses ranged from a 24% difference (36% - 12%) at level 5S, to a 3% difference (38% - 35%) at level 6M.

Coursework directed at broadening appreciation of art and literature (See Table 84, Appendix E).--Not more than 15% of the prefer more or right amount engineers at any occupational level felt that study directed at broadening their appreciation of art and literature met their aims to a great extent.

The majority of right amount engineers at all levels, except those right amount engineers at levels 1, 5S, and 5M who felt their aims are not met, feel that this type of study only meets their aims to a fair extent. Percentages of right amount engineers whose aims are met to a fair extent range from 58% at staff level 4S to 28% at level 1. The majority of right amount engineers at level 1, staff level 5S, and managerial level 5M feel that studies directed at broadening their appreciation of art and literature meet their aims to little or no extent, with percentages of 61%, 62%, and 53%, respectively.

Responses from the prefer more engineers parallel those of the right amount engineers, with most majority percentages occurring in the fair degree of meeting aims category, where percentages range from 63% at managerial levels 5M and 6M to 45% at staff level 4S. At staff level 5S, the majority percentage of prefer more engineers, 54%, feel that these studies meet their aims to little or no extent. At level 2, opinion of the prefer more engineers is equally divided with half feeling these studies did not meet their aims, and half feeling they met their aims only partially.

Coursework concerning management skills and dealing with others (See Table 85, Appendix E).--For the right amount engineers, only the majority of engineers at the managerial levels feel that studies concerning management skills and dealing with others greatly meet their aims.

Percentages of right amount engineers who felt this coursework greatly met their aims ranged from 70% at managerial level 4M, to 55% at managerial levels 5M and 6M.

At all other levels, staff and lower, the majority viewpoint of the right amount engineers was that studies of this nature only partially met their aims. Percentages ranged from 65% at level 3, to 54% at staff level 5S. At level 1, 39% of the right amount engineers felt that their aims were not met by these studies, and 39% felt that these studies met their aims only partially.

For the prefer more engineers at all occupational levels, except at level 4S, the largest proportion felt that studies concerning management skills and dealing with others met their aims to a large extent. Percentages ranged from a low of 33% at level 1, where all opinion categories were equal, to a high of 72% at managerial level 4M. At level 4S, the majority of prefer more engineers felt this type of study fairly met their aims.

At all occupational levels, the percentages of prefer more engineers were higher than those of the right amount engineers who felt that studies concerning managerial skills and dealing with people greatly met their aims. The differences in percentages between the higher prefer more response and the lower right amount response ranged from a high of 38% (65%-27%) at level 3, to a low of 2% (72%-70%) at managerial level 4M.

Coursework about other Company products and systems (See Table 86, Appendix E).--The largest percentages exhibited by all occupational levels were of the opinion that studies about other Company products and systems only partially met their aims. Percentages of right amount engineers who felt this way ranged from 50% at level 1, to 72% at staff level 4S.

The same situation exists for the prefer more engineers with the majority feeling their aims are only partially met by this type of study, with percentages ranging from 54% at staff level 5S, to 100% at managerial level 6M.

Summary of the Correspondence of Selected Types of Coursework and the Engineers' Educational Aims

In the preceding sections the importance to the engineers of certain objectives in additional education or training was investigated. These objectives were placed in a hierarchy of importance. Differences between the responses of the prefer more and the right amount engineers were then considered.

In the next sections, the same procedure will be followed, but here the correspondence of certain types of study with the aims of the population of engineers will be considered.

Engineers' Attitudes Toward Particular Courses of Study

Additional coursework dealing with their field (electrical engr., mechanical engr., etc.) met the aims of the majority of right amount engineers to a great extent at more occupational levels than any other type of coursework. For the right amount engineers at level 1, 2, 3, and staff levels 4S and 5S, the majority opinion was that coursework of this type greatly or exactly met their aims. Only the majority of right amount engineers at managerial levels 4M, 5M, and 6M felt that coursework dealing with their field only met their aims fairly well. The same pattern was followed by the prefer more engineers. Only at level 4S was there a difference; here the majority of prefer more engineers felt that coursework dealing with their field only partially met their aims.

The majority of right amount engineers at occupational levels 1, 3, and staff level 4S felt that coursework directed specifically at their specialty (feedback control, magnetics, statistics, etc.) met their aims to a large extent or exactly. The majority of right amount engineers at the remaining occupational levels, 2, staff level 5S, and managerial levels 4M, 5M, and 6M, felt that coursework of this nature met their aims only partially. However, except at levels 2, 4S, and 6M, the majority of prefer more engineers at all other occupational levels felt that coursework of this nature only partially met their aims.

Courses concerning management skills and dealing with others ranked next in best meeting the aims of engineers at all occupational levels. Only at level 1 did the majority of right amount engineers feel that coursework of this nature best met their aims only partially or not

at all. Levels 2, 3, and staff levels 4S and 5S felt this coursework met their aims fairly well. At the managerial levels, 4M, 5M, and 6M, however, the right amount engineers felt coursework of this nature met their aims to a great extent. It is of further interest to note that at each occupational level, a greater proportion of the prefer more than the right amount engineers felt that coursework concerning managerial skills and dealing with others met their aims to a great extent.

Coursework dealing with other company products and systems, dealing with general science outside the engineer's field, dealing with general topics in the social sciences (psychology, sociology, etc.), and directed at improving knowledge of economics and business matters were considered by the majority of right amount engineers at all occupational levels to only fairly meet their aims.

It should be noted, however, that additional coursework dealing with general topics in the social sciences (psychology, sociology, etc.) and coursework directed at improving the engineer's knowledge of economics and business matters are consistently rated at all occupational levels as greatly meeting the aims of a larger proportion of the prefer more than right amount engineers. This is not true at managerial level 5M, for coursework concerning economics and business matters. However, if the fair and great fulfillment categories are totaled, the proportion of prefer more engineers is greater at this level also.

Coursework about the Corporation and its organization is considered by the right amount engineers at all occupational levels, except level 1, to meet the engineers' aims only fairly well. At level 1, the majority of engineers felt this type of coursework offers little or nothing in the way of meeting aims.

Coursework directed at broadening the engineers' appreciation of art and literature met the aims of the engineering population to the least extent of any type of coursework examined. Right amount engineers at levels 1, staff level 5S, and managerial level 5M feel coursework of this nature met their aims to little or no extent. At the remaining occupational levels, this type of coursework is felt only partially to meet the right amount engineers' aims.

The Hierarchy of Desired Coursework of the Right Amount Engineers

The same procedure that was used to set up the hierarchy of educational objectives will be used here to set up a hierarchy of coursework that meets the aims of the right amount engineers. The coursework that is considered to meet aims to a great extent or exactly, by the majority of engineers at the largest number of occupational levels, will be considered to meet the aims of the right amount engineers in the organization to the fullest extent. The coursework considered to meet aims not at all or very little by the largest number of occupational levels will be considered to be of the lowest degree in meeting the total group of engineers' aims. Factors which fall in between these two extremes will be placed in the continuum.

The hierarchy of coursework as it meets the aims of the right amount engineers in the organization is as follows:

1. Dealing with the engineer's field (electrical engr., mechanical engr., etc.)
2. Directed specifically at the engineer's specialty
3. Concerning management skills and dealing with others
4. About other company products and systems
   Dealing with general science outside the engineer's field
   Dealing with general topics in the social sciences
   Directed at improving knowledge of economics and business matters
5. About the Company and its organization
6. Directed at broadening appreciation of art and literature

Summary of Differences Between Responses of the Prefer More and Right Amount Engineers Toward Selected Coursework

The most dramatic difference between the responses of the prefer more and the right amount engineers occurs in the assessment of coursework concerning management skills and dealing with others. The responses of the prefer more engineers at all occupational levels indicate that coursework of this nature meets their aims to a greater extent than it does for the right amount engineers.

The prefer more engineers also had larger proportions of engineers at each occupational level who felt that education dealing with general topics in the social sciences met their aims to a great extent.

Similarly, larger proportions of the prefer more engineers felt their aims were better met by coursework about the Company and its

organization and coursework directed at improving their knowledge of economics and business matters.

In general, the prefer more engineers tended to feel that coursework dealing with managerial skills, organizational, and business matters met their aims to a greater extent than did the right amount engineers.

Few differences were detected between the prefer more and right amount engineers' responses concerning coursework dealing with the engineer's field, his specialty, his appreciation of art and literature, and his knowledge about other Company products and systems.

Summary

The evidence in this chapter dealing with the engineers' objectives for additional education and the degree to which their aims are met by a particular type of coursework has further supported the findings of the last chapter which examined personal goals.

It was pointed out in the personal goals section that the prefer more engineers tended to attach greater importance to managerial goals. In this section, where the importance of specific educational objectives was examined, it was found that the prefer more engineers attached greater importance to educational objectives of a managerial nature. Further, in examining the degree of compatibility between types of coursework and the engineers' aims, the prefer more engineers were found to feel that coursework concerned with managerial skills and dealing with people met their aims to a greater extent than this type of coursework did for the right amount engineers.

Further indication of the existence of different perspectives at different occupational levels and the drift in the engineers' attitudes from a technical to a managerial orientation were found in this chapter.

For example, at lower engineering levels, the majority of engineers feel that the road to success is to become an expert in their engineering specialty. However, as higher occupational levels are investigated, this attitude is held by fewer engineers. Apparently the engineer perceives that managerial abilities are becoming more important and technical abilities alone will not lead to the greatest amount of upward mobility.

These findings provide further evidence to support the hypothesis that the prefer more group is composed to a greater extent, than is the right amount of work group, of engineers who are interested in a managerial position or the performance of managerial tasks and that this managerial orientation becomes more apparent as higher occupational levels are investigated.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This study has inquired into the motivation and the meaning behind the engineer's preference to do more work.

The line of inquiry first investigated whether there did exist any characteristics of an organizational, personality, or demographic nature by which the engineers who preferred more work could be described. While it was determined that a higher than average percentage of engineers who preferred more work did exist at particular occupational levels, which could be associated with young engineers and engineers at important points in their mobility patterns, the one engineer out of five at all occupational levels who preferred more work could not be explained in terms of these variables.

The factor that was common to most engineers who preferred more work was dissatisfaction with the work content of their jobs. Specifically, they were dissatisfied with the level of the technical work they were asked to perform and desired technical work of a higher level. They felt that their present work did not offer them the opportunity to utilize their technical skills to their best advantage. They felt that their intellectual potential was not being utilized to its fullest extent and they were dissatisfied with their advancement in the organization. However, still to be explained was why the engineers who were identified by their preference for more work, out of all engineers in this study, should be dissatisfied with the level of their technical work. In order to explain this, it was first hypothesized that the engineers who prefer more work attach greater importance to technical and scientific personal goals and therefore desired higher level technical work to satisfy these personal goals. If this were true, by attaching more importance to technical goals, the prefer more engineers would tend to demand higher level technical work. In short, a case where technical work was desired as an end in itself. It was further hypothesized that if the prefer more engineers were given higher level technical work, work which would better utilize their technical abilities,

they would tend to be more satisfied with the work situation.

To test these hypotheses, the importance attached to selected personal goals by those engineers who prefer more work and those who have the right amount of work were compared. It was expected that there would be more engineers who prefer more work than engineers who feel they have the right amount of work attaching great importance to technical goals and the hypotheses would be proved.

The hypotheses were disproved. The investigation of the prefer more engineers' goal structure indicated that the demand for higher level, more challenging technical work might not be the only motivation, nor the basic motivation, behind the engineers' prefer more response.

Upon analyzing the prefer more engineers' responses toward the importance of certain goals, it was found that they did not tend to attach any greater importance to technical goals than did any of the other engineers making up this study. Rather, the prefer more engineers consistently attached greater importance to managerial and organizational goals.

The prefer more engineers, while attaching importance to high level technical work, also attached importance to managerial and organizational goals. The other goals categories investigated -- scientific, technical, monetary, dependency, security and good life, and autonomy goals -- were found to be of no more importance to the prefer more engineers than to the rest of the engineering population. However, greater importance was attached by the prefer more engineers to managerial, company affiliation, and power goals.

What the prefer more engineers appeared to attach most importance to, and be most interested in, was work of a managerial nature. Concerning technical work, they appear to be more interested in directing it than performing it.

Since it is felt that educational objectives are indicative of the future career objectives of the engineer, the managerial orientation of the prefer more engineers relative to the right amount engineers was tested further in a comparison of the importance of objectives and compatibility of aims in further education of the prefer more and right amount engineers.

Here too it was found that the prefer more engineers place

greater emphasis on additional education which prepares them for managerial duties. As the prefer more engineers attached greater importance to managerial goals than did the right amount of work engineers, they also attach greater importance to educational objectives of a managerial nature. Further, the prefer more engineers feel that coursework concerning managerial skills and dealing with people better met their aims than the other types of coursework examined. Further substantiation of the prefer more engineers' managerial orientation had been obtained.

If the prefer more engineers hold managerial goals to be of importance, and if they feel educational preparation of a managerial nature best meets their aims and objectives, why do they demonstrate a greater feeling of poor technical utilization?

Two hypotheses were proposed on this question. The first was that the prefer more engineers desire to become managers. However, in order to become managers, they must demonstrate their ability and prowess in technical matters. If they perform the same functions as the other engineers and work on what might be called "routine" technical work, it is difficult for them to distinguish themselves, hence they desire higher level technical work through which they can demonstrate their ability. In this case, the engineers would be primarily interested in mobility and seek every opportunity through which they could demonstrate their worth and be promoted to higher positions.

The other hypothesis was that the prefer more engineers seek higher level technical work and feel that only through assuming directive or managerial positions will they be able to get the higher level technical work which they desire.

The second hypothesis does not appear to be substantiated by the evidence at hand. Both the analyses of goal importance and educational objectives in Chapters IV and V indicated that the prefer more engineers appear to be less interested in performing than directing technical work. However, before dismissing this hypothesis, consideration must be given to how the engineer views the engineering organization and compares the relative merits of a managerial or staff position.

The prefer more engineers feel that a managerial position offers more potential for having contributions recognized, salary, effort

required, chance to make important technical decisions, prestige, ability required, potential for getting action on their ideas, excitement, potential for advancement, and power to initiate programs. On the other hand, a staff professional position is felt to offer more interesting work, utilization of skills, and opportunity to follow one's own interests.

Considering that a staff position is felt to offer more interesting work, utilization of skills, and opportunity to follow one's own interests, this is what the prefer more engineers appeared to be most dissatisfied with. The prefer more engineers expressed the opinion that they were dissatisfied because their work was of little interest and they were poorly utilized. If they feel that a staff position offers these factors to a larger extent than a managerial position, why do the prefer more engineers stress the importance of managerial goals and exhibit, in general, a managerial orientation?

The prefer more engineers are found not to be satisfied with their advancement and place greater emphasis on achieving a high occupational level position. At the same time, the prefer more engineer feels that a managerial position offers much more opportunity for recognition, promotion, and making responsible decisions. In short, the desirability of a managerial position from the point of view of the above factors may overshadow the technical goals of the prefer more engineers and submerge them in the engineers' greater desires for advancement. Therefore, the prefer more group may be composed of engineers who are not only interested in higher level technical work, but also organizational advancement. The prefer more category is made up of engineers who seek as rapid advancement as possible, and, because as they rise in the organization, they come to perceive that a managerial position offers them the greater opportunity for rewards and advancement, they tend to take on a managerial orientation. Because the prefer more engineers are interested in advancement, they may hold managerial goals as more important and more rewarding, even though they may desire higher level technical work.

This conclusion is further substantiated by the findings of Chapters II, IV, and V describing changes that take place at different occupational levels in the engineers' perspectives which increasingly

favor managerial positions.

In general, it was shown in Chapter II that, as higher occupational levels are viewed, a change in perspective favoring a managerial over a staff position does take place. At lower levels a staff position is viewed more favorably, whereas at higher levels a managerial position is viewed as more desirable by the majority of engineers at that level. Similarly, in Chapter IV it was shown that at higher occupational levels technical goals appear to be less emphasized and managerial and organizational goals more emphasized.

Following this occupational level breakdown, the prefer more engineers can be divided into two groups. Those who desire higher level technical work, but take on a managerial orientation because they consider a staff position to be inferior, and those who desire higher level technical work because they are sincerely interested in technical work and have little interest in managerial functions.

If the standard procedure of the dual hierarchy operates, the last group of engineers, those who are sincerely interested in technical work alone, should present little problem for management if they are promoted to the staff side of the organization.

The other group may pose more of a problem to the company. These engineers, interested in managerial positions, will be relatively satisfied if they are able to achieve a managerial position and promotion within the managerial ranks. However, if these engineers, with managerial aspirations, are unable to attain a managerial position by virtue of inability or lack of an opening in the managerial ranks, they will be promoted to staff positions. Here they will most probably be dissatisfied.

It was shown in the discussion of the desirability of staff versus managerial positions in Chapter II that those staff professionals who prefer more work regard a promotion to a staff position as less desirable than a promotion to a managerial position. Therefore the prefer more engineers with their managerial aspirations will be even more dissatisfied than the other engineers when promoted to a staff position.

The problem of the movement of engineers who are interested in a managerial position, the prefer more engineers especially, will become more acute in the future. An engineering work force is now

emerging with many more engineers being employed than have been in the past. It can then be expected that more and more dissatisfaction will become apparent among those engineers who desire managerial duties. The type of engineer who will be promoted to a staff position in the future will not necessarily be the individual who enjoys technical work, who was passed over, or who dislikes dealing with people. Rather, he may be promoted to a staff position only because the managerial ranks are full.

What has been outlined above is true for the prefer more engineers to a greater degree than for the rest of the engineering population. However, while the degree of intensity of managerial desires is not so great among the general population of engineers in this study, it is nevertheless present. This factor will further compound the problems of dissatisfaction among engineers, as this indicates that almost all engineers are interested in a managerial position to some extent.

A statement by a managerial engineer may help to clarify the question of why most engineers appear to be interested in a managerial position even though they may be interested in technical work. The engineer was explaining to the interviewer why he felt that most of his work was distasteful to him and that he preferred the technical kind of activity.

"I spend most of my time in planning, managerial problems, and just plain hand holding."

He was then asked why he preferred a managerial position, He said: "Power! To be brutally frank, power. You see, in this position I have some say in policy decisions. As a technical engineer I would have to stick to design problems."[1]

In summary, the findings of this research indicate that the prefer more engineers are dissatisfied with the technical content of their work and desire higher level technical work. At the same time, they display a higher than average desire to assume managerial duties. Whether

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[1]Richard R. Ritti, "The Dual Ladder of Engineering Advancement -- The Past and the Future," Corporation study, January 1964, unpublished, p. 10

this desire to assume managerial duties results from an inherent quality in the engineer's personality or has developed as a result of his interaction within the organization cannot be definitely determined. However, the findings of this study have given strong indication that the engineer's perception of greater rewards existing in a managerial, as opposed to a staff role, influences him to take a managerial orientation.

Significance for Management

Whether the desire for higher level technical work expressed by the prefer more engineers is advantageous in an organization is a question for discussion.

It can be considered an advantage if the response is interpreted as characteristic of a group of engineers who are continually striving for increased challenges. From this point of view, a dissatisfaction based on needs of this sort can be considered desirable in an organization. However, it can be an indication of an organizational failure. A failure of management to utilize properly the available engineering talent.

While these are certainly significant factors for management to consider, I feel that the significant finding of this study is the high emphasis that the prefer more engineer places on managerial goals.

If the prefer more engineers' desires for higher level technical work are connected with a desire for managerial attainment, it may be considered to be a further characteristic of a group of aggressive, striving engineers. This may be considered to be a desirable situation as an organization needs engineers who constantly seek further challenge, advancement, and responsibility.

However, if these engineers become managerially oriented and desire a managerial position because they feel they cannot achieve the same position of power, status, or economic attainment in a staff position; and, even though they are interested in technical work, strive to become managers, this may be viewed as an unfortunate situation. Engineers who actually would prefer to devote themselves to technical problems now swell the managerial ranks because their need for personal reward, monetary compensation, or power found in a managerial

position is greater than their desire to do technical work and their ability to be content in a staff position. These engineers may have been satisfied to perform a staff role had the staff role not become a very poor second to a managerial position both in tangible and intangible compensation.

A comment volunteered by an engineer was," It is almost a disgrace . . . to be an experienced engineer of age 40 in a technical position."[2]

This situation can cause two sources of dissatisfaction. First, the technical professional staff engineer is dissatisfied because of his second class status in the organization. The would be staff engineer seeks a managerial position for its greater rewards and fills managerial ranks. This causes a second great source of dissatisfaction originating from the engineer who dislikes technical work and would prefer a managerial position because it better fits his basic interests, but is promoted to a staff position because the managerial ranks are full.[3]

If this situation is allowed to continue, as the managerial positions become more crowded, more and more engineers will have to enter the staff positions and be dissatisfied because of the second class status and inequity of reward distribution a staff position offers.

Not only is this situation unfortunate because of its aggravating dissatisfactions on the part of the engineers, but also because it is wasteful of engineering talent. An engineer may be able to make technical contributions of a high order, but (as in the case of the engineer quoted earlier who said he prefers technical work, but can only satisfy his need for power in a managerial position), because the engineer is interested in rewards and advancement which a staff position cannot offer, he strives for a managerial position and is most unhappy if he does not achieve one. The engineer may occupy a managerial position whose work tasks he may not actually like and deprive the organization of his technical talent.

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[2]Richard R. Ritti, Ibid. pg. 1.

[3]Cf. Everett C. Hughes, "Personality Types and the Division of Labor," American Journal of Sociology, XXXIII, 1928, pp. 754-768.

APPENDIX A

ABRIDGED CORPORATION QUESTIONNAIRE

SURVEY OF PROFESSIONAL AND TECHNICAL PERSONNEL

Dear Sir:

This is a survey of the ideas and opinions of our professional and technical people. Through this questionnaire we hope to learn what patterns of leadership and what organizational policies work best and bring the greatest satisfaction to people in your kind of work.

WHAT YOU SAY IN THIS QUESTIONNAIRE IS COMPLETELY CONFIDENTIAL. This questionnaire will be keypunched on a card and then destroyed. Any report that is made of the results of this survey will be in the form of a statistical summary. We have no interest in the identification of individuals.

THIS IS NOT A TEST. There are no right or wrong answers.

Basic Personnel Research Staff
Corporate Head Quarters

HOW WOULD YOU RATE YOUR JOB ON THESE POINTS? CIRCLE ONE IN EACH LINE ACROSS:

	Very Good 5	Good 4	Average 3	Poor 2	Very Poor 1
1. Physical working conditions (space, light, noise, cleanliness, etc.)	5	4	3	2	1
2. Your salary considering your duties and responsibilities	5	4	3	2	1
3. Your salary considering what you could get for the same work at other companies	5	4	3	2	1
4. Your opportunities to move to a better job in the future	5	4	3	2	1

5. Disregarding economic necessity, how important a place would you say your work occupies in your life? CIRCLE ONE:

   5 - It is the single most important thing
   4 - It is extremely important
   3 - Quite important
   2 - Fairly important
   1 - It is of little importance

6. How do you feel about the amount of work you are expected to do? CIRCLE ONE:

   3 - Too much
   2 - About the right amount
   1 - I would prefer to do more

7. How well satisfied are you with the advancement you have received since starting to work in this corporation? CIRCLE ONE:

   5 - Very satisfied
   4 - Fairly satisfied
   3 - So-So
   2 - Fairly dissatisfied
   1 - Very dissatisfied

8. How do you like your job -- the kind of work you do? CIRCLE ONE:

5 - Very good
4 - Good
3 - Average
2 - Poor
1 - Very Poor

9. How would you rate the intellectual demands of your present job? CIRCLE ONE:

6 - Extremely heavy
5 - Quite heavy
4 - Slightly heavy
3 - Slightly light
2 - Quite light
1 - Extremely light

10. In general, would you say that the work description you have just given us represents a satisfying kind of job for you?

0	1	2	3	4	5	6	7	8	9	10
No, completely unsatisfying										Yes, completely satisfying

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PERSONAL GOALS DESCRIPTION

On the pages that follow we are going to ask you to show how you feel about a representative group of personal goals. For this purpose, try to place yourself in the following situation:

You are considering a move to another position that has been offered you. While it may be that you have no desire to change, you still go through the process of evaluating the potential of this position for satisfying your goals. You ask yourself the question,

"How important is this to me?"

That is what we are asking you now. How important would the following considerations be in your process of evaluating a new position?

How important is it to you to:

		Of no importance whatsoever										Of utmost importance
1.	Work for a company whose reputation is respected by others in your field	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
2.	Gain knowledge of company management policies and practices.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
3.	Publish articles in technical journals.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
4.	Teach and guide others in technical activities.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
5.	Have little tension and stress on the job.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
6.	Make more money than the "average" college graduate.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
7.	Live in a location and community that is desirable to you and your family.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
8.	Have the opportunity to help the company increase it profits.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
9.	Make all the decisions on matters directly concerning your technical responsibility.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
10.	Advance to a high level staff technical position.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
11.	Have adequate retirement, health insurance and other company benefits.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost

12. Establish a reputation outside the company as an authority in your field.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
13. Work on problems that have practical aplications important to your company.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
14. Have the opportunity to explore new ideas about technology or systems.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
15. Have someone to guide your technical efforts.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
16. Have stability in your life and work.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
17. Participate in decisions that affect the future business of the company.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
18. Have freedom to adopt your own approach to the job.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
19. Be the technical leader of a group of less experienced professionals.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
20. Learn administrative methods and procedures.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
21. Keep informed on what your company is doing.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
22. Be given clear, detailed instructions as to how to proceed with the job.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
23. Be known in the company as an expert in your field of specialty.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
24. Have the opportunity to help the company build its reputation as a first class organization.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost

25. Become a first-line manager in your line of work.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
26. Learn how the business is set up and run.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
27. Receive better than average salary increases.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
28. Work with others who are outstanding in their technical achievements.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
29. Work on projects that you yourself have originated.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
30. Be free to set your own working hours and pace as long as you are meeting scheduled objectives.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
31. Know what the goals of your division are.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
32. Make a great deal of money.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
33. Have the opportunity to work on complex technical problems.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
34. Participate in decisions that set the direction of technical effort in the company.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
35. Be individually responsible for technical projects (rather than work with a group).	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
36. Work on projects that utilize the latest theoretical results in your specialty.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost

37. Advance to a policy-making position in management.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
38. Work in a cooperative, friendly atmosphere.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
39. Have few worries, tensions and troubles.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
40. Have the opportunity to see the concrete results of what you have done.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
41. Work in a well-ordered job situation where the requirements are clear.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
42. Have the opportunity to discuss the results of your work with those in higher management.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
43. Follow your own theoretical interests whether or not they promise a "payoff" for the company.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
44. Work on projects that require learning new technical knowledge.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
45. Receive patents on your technical ideas.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
46. Work on projects that have a direct impact on the business success of your company.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
47. Communicate your ideas to others in your profession through papers delivered at professional meetings.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost
48. Be evaluated only on the basis of your technical contributions.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost

49.

NO
YO

50.

49. Work on problems that are of special interest to higher management.	0 None	1	2	3	4	5	6	7	8	9	10 Utmost

NOW THAT YOU HAVE FINISHED DESCRIBING YOUR GOALS, WOULD YOU PLEASE GIVE US AN EVALUATION.

50. In general, would you say that the work you are presently doing is helping you to achieve your more important goals.	0 No, not at all	1	2	3	4	5	6	7	8	9	10 Yes completely

EDUCATION

The section that follows contains some questions on the need and purpose of continued education.

The questions refer to training or education received in formal course-work. These courses may have been given either by the Corporation or by a college or university.

THE FOLLOWING IS A LIST OF SOME OBJECTIVES PEOPLE MAY HAVE IN GETTING ADDITIONAL EDUCATION OR TRAINING. WOULD YOU PLEASE RATE THESE OBJECTIVES ON THEIR IMPORTANCE TO YOU.

1. To prepare myself for increased technical responsibilities.
   0 1 2 3 4 5 6 7 8 9 10
   Of no importance — Of utmost importance

2. To remedy deficiencies in my initial training.
   0 1 2 3 4 5 6 7 8 9 10
   Of no importance — Of utmost importance

3. To obtain an advanced degree (or a bachelors degree).
   0 1 2 3 4 5 6 7 8 9 10
   Of no importance — Of utmost importance

4. To help me prepare for a position in management.
   0 1 2 3 4 5 6 7 8 9 10
   Of no importance — Of utmost importance

5. To perform my present assignment better.
   0 1 2 3 4 5 6 7 8 9 10
   Of no importance — Of utmost importance

6. To keep from becoming obsolete.
   0 1 2 3 4 5 6 7 8 9 10
   Of no importance — Of utmost importance

7. Because my manager expects his people to take additional coursework.
   0 1 2 3 4 5 6 7 8 9 10
   Of no importance — Of utmost importance

8. To enable me to become an authority in my field of specialty.

0 1 2 3 4 5 6 7 8 9 10
Of no importance — Of utmost importance

IF YOU DO TAKE ADDITIONAL COURSEWORK, WHAT TYPES OF STUDY WOULD BE MOST IN LINE WITH YOUR AIMS?

9. About the Company and its organization.

0 1 2 3 4 5 6 7 8 9 10
Not meet my aims at all — Meet my aims exactly

10. Dealing with my field (electrical engr., mechanical engr., etc.)

0 1 2 3 4 5 6 7 8 9 10
Not meet my aims at all — Meet my aims exactly

11. Dealing with general science outside my field.

0 1 2 3 4 5 6 7 8 9 10
Not meet my aims at all — Meet my aims exactly

12. Directed specifically at my specialty (feedback control, magnetics, etc.).

0 1 2 3 4 5 6 7 8 9 10
Not meet my aims at all — Meet my aims exactly

13. Dealing with general topics in the social sciences (psychology, sociology, etc.).

0 1 2 3 4 5 6 7 8 9 10
Not meet my aims at all — Meet my aims exactly

14. Directed at improving my knowledge of economics and business matters.

0 1 2 3 4 5 6 7 8 9 10
Not meet my aims at all — Meet my aims exactly

15. Directed at broadening my appreciation of art and literature.

0 1 2 3 4 5 6 7 8 9 10

Not meet my aims at all — Meet my aims exactly

16. Concerning management skills and dealing with others.

0 1 2 3 4 5 6 7 8 9 10

Not meet my aims at all — Meet my aims exactly

17. About other company products and systems.

0 1 2 3 4 5 6 7 8 9 10

Not meet my aims at all — Meet my aims exactly

18. During the past year have you ever been asked to work on a job that you felt could be handled by someone with less technical training than yourself? CIRCLE ONE:

1 - Yes
2 - No

19. Would you agree that there is considerable mal-utilization of people in your kind of work -- too many professional people working on details that others could handle? CIRCLE ONE:

3 - Agree fully
2 - Agree partly
1 - Disagree

OVERALL EVALUATION

The questions that follow concern your evaluation of your work . . . and your position in the organization. Most of the questions deal with how satisfied you are with these aspects of your job. This is the final part of the questionnaire.

1. How well would you say your job "measures up" to what you want of a job? 0 1 2 3 4 5 6 7 8 9 10
   Extremely poorly — Extremely well

2. Some people in technical work are very deeply involved in their work. To others, their work is just another job. How would you say you feel about this? 0 1 2 3 4 5 6 7 8 9 10
   Not at all involved — Most deeply involved

3. How do you think most technical people view a promotion from Senior Associate level to Staff level as compared to a promotion from Senior Associate level to Project level? CIRCLE ONE:

   5 - A promotion to Staff level is viewed as a much bigger promotion than one to Project level.

   4 - A promotion to Staff level is viewed as a slightly bigger promotion than one to Project level.

   3 - Both promotions are viewed as about equal.

   2 - A promotion to Project level is usually viewed as a slightly bigger promotion than one to Staff.

   1 - A promotion to Project level is usually viewed as a bigger promotion than one to Staff level.

4. While you may already have been promoted to either a managerial position or a staff professional position, if you had your choice, would you rather be a manager of a group or a staff professional at a similar level (for example, be a project level manager or a staff level professional). CIRCLE ONE:

   5 - I would much rather be a staff professional.

   4 - I would somewhat rather be a staff professional.

   3 - It doesn't make any difference.

   2 - I would somewhat rather be a manager.

   1 - I would much rather be a manager.

LISTED BELOW ARE SOME OF THE WAYS IN WHICH A MANAGERIAL JOB MIGHT DIFFER FROM AN EQUIVALENT STAFF PROFESSIONAL JOB. IN YOUR OPINION, TO WHAT EXTENT DO THE TWO TYPES OF JOBS DIFFER IN: CIRCLE ONE:

	Staff Much More 5	Staff Slightly More 4	About The Same 3	Managerial Slightly More 2	Managerial Much More 1
5. Interesting work	5	4	3	2	1
6. Utilization of skills	5	4	3	2	1
7. Having your contributions recognized	5	4	3	2	1
8. Salary	5	4	3	2	1
9. Effort required	5	4	3	2	1
10. Chance to make important technical decisions	5	4	3	2	1
11. Prestige	5	4	3	2	1
12. Opportunity to follow your own interests	5	4	3	2	1
13. Ability required	5	4	3	2	1
14. Potential for getting action on your ideas	5	4	3	2	1
15. Excitement	5	4	3	2	1
16. Potential for advancement	5	4	3	2	1
17. Power to initiate programs	5	4	3	2	1

18. All in all, do you feel that the Dual Ladder system of advancement helps people in your kind of work to meet their personal goals? CIRCLE ONE:

5 - Yes, it helps a great deal in meeting these goals.
4 - Yes, it helps somewhat.
3 - It neither helps nor hinders.
2 - No, it hinders somewhat.
1 - No, it hinders a great deal in meeting these goals.

19. Which one of these descriptions best fits your immediate work group? CIRCLE ONE:

    1 - A complete project
    2 - A part of a larger project
    3 - A service group (test set design, machine design, etc.)
    4 - A functional group (specialists in thermodynamics, specialists in solid state physics, etc.)
    5 - A product group (specific product lines)

20. How much education have you had? CIRCLE ONE:

    1 - Up to or including high school
    2 - Technical school, business school, or some college work
    3 - Bachelor's degree
    4 - Master's degree
    5 - Doctor's degree

21. What is your occupational code level? CIRCLE ONE: (Note: The sequence of listing is determined by programming and analysis requirements.)

    STAFF PROFESSIONAL

    1 - Senior level (6S)
    2 - Advisory level (5S)
    3 - Staff level (4S)

    PROFESSIONAL

    4 - Senior Associate level (3)
    5 - Associate level (2)
    6 - Junior level (1)

    MANAGERIAL

    1 - Senior level (6M)
    2 - Development level (5M)
    3 - Project level (4M)

THANK YOU. YOUR HELP IS GENUINELY APPRECIATED.

APPENDIX B

Tables 1-16, 18-34

TABLE 1.--Engineers' Views on Managerial and Staff Promotions

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	8	38	50	13	0	0
Right Amount	22	23	64	14	0	0
5M						
PM	25	48	44	8	0	0
RA	66	38	56	5	2	0
4M						
PM	46	33	59	4	2	2
RA	138	30	51	19	0	1
5S						
PM	16	63	37	0	0	0
RA	26	27	46	19	8	0
4S						
PM	22	55	27	14	5	0
RA	53	30	62	6	2	0
3						
PM	24	21	63	13	4	0
RA	48	21	52	19	4	4
2						
PM	16	19	44	25	13	0
RA	55	27	45	18	9	0
1						
PM	15	13	60	13	7	7
RA	17	12	35	29	24	0

*Percentages of those who feel:

1. A promotion to Project level is usually viewed as a much bigger promotion
2. A promotion to Project level is usually viewed as a slightly bigger promotion
3. Both promotions are viewed as about equal
4. A promotion to Staff level is viewed as a slightly bigger promotion
5. A promotion to Staff level is viewed as a much bigger promotion

TABLE 2.--Engineers' Choice of a Managerial or Staff Position

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	67	33	0	0	0
Right Amount	22	59	27	5	5	5
5M						
PM	24	67	17	17	0	0
RA	67	58	31	7	3	0
4M						
PM	47	62	23	0	13	2
RA	137	54	27	5	7	7
5S						
PM	16	38	19	6	13	25
RA	29	10	21	3	21	45
4S						
PM	22	23	23	9	27	18
RA	55	9	22	7	31	31
3						
PM	24	29	21	8	21	21
RA	48	13	40	4	25	19
2						
PM	16	38	19	6	31	6
RA	55	22	24	11	27	16
1						
PM	15	20	27	7	7	40
RA	17	18	12	6	29	35

*Percentages of those who say:

1. I would much rather be a manager.
2. I would somewhat rather be a manager.
3. It doesn't make any difference.
4. I would somewhat rather be a staff professional.
5. I would much rather be a staff professional.

TABLE 3.--Engineers' Assessment of the Extent to which Equivalent Managerial and Staff Positions Differ in Interesting Work

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	22	11	44	22	0
Right Amount	22	23	23	36	5	14
5M						
PM	24	29	42	17	8	4
RA	67	16	25	34	18	6
4M						
PM	46	39	15	28	13	4
RA	137	24	23	27	18	7
5S						
PM	15	20	13	27	7	33
RA	29	10	0	21	31	38
4S						
PM	22	14	18	18	27	23
RA	55	4	15	24	25	33
3						
PM	24	17	17	25	25	17
RA	47	0	23	28	26	23
2						
PM	16	19	13	38	13	19
RA	55	9	16	29	29	16
1						
PM	13	8	8	31	31	23
RA	17	6	18	18	18	41

*Percentages of those who feel:

1. Managerial much more interesting
2. Managerial slightly more interesting
3. About the same
4. Staff slightly more interesting
5. Staff much more interesting

TABLE 4.--Engineers' Assessment of the Extent to which Equivalent Managerial and Staff Positions Differ in Their Utilization of Skills

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	22	22	33	11	11
Right Amount	22	14	23	41	14	9
5M						
PM	25	12	32	28	24	4
RA	66	6	32	33	20	9
4M						
PM	46	13	20	35	17	15
RA	137	9	12	29	33	16
5S						
PM	16	13	13	25	19	31
RA	29	7	10	34	17	31
4S						
PM	22	5	18	36	18	23
RA	55	0	16	22	24	38
3						
PM	24	0	13	42	25	21
RA	48	4	10	31	27	27
2						
PM	16	6	6	50	38	0
RA	55	4	13	22	36	25
1						
PM	14	0	14	29	29	29
RA	17	6	0	24	35	35

*Percentages of those who feel:

1. Managerial utilizes skills much more
2. Managerial utilizes skills slightly more
3. About the same
4. Staff utilizes skills slightly more
5. Staff utilizes skills much more

TABLE 5.--Engineers' Assessment of the Extent to which Equivalent Managerial and Staff Positions Differ in Having Contributions Recognized

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	44	33	11	11	0
Right Amount	22	27	32	32	5	5
5M						
PM	25	12	32	36	16	4
RA	67	13	28	25	24	9
4M						
PM	46	22	28	20	24	7
RA	135	8	27	42	17	5
5S						
PM	16	25	25	19	13	19
RA	28	14	32	36	11	7
4S						
PM	22	27	45	18	5	5
RA	55	18	45	29	2	5
3						
PM	24	33	42	8	17	0
RA	47	26	32	26	13	4
2						
PM	16	25	19	31	6	19
RA	55	15	36	29	18	2
1						
PM	13	15	23	23	23	15
RA	17	24	12	35	12	18

*Percentages of those who feel:

1. Contributions recognized much more in managerial
2. Contributions recognized slightly more in managerial
3. About the same
4. Contributions recognized slightly more in staff
5. Contributions recognized much more in staff

TABLE 6.--Engineers' Assessment of the Extent to which Equivalent Managerial and Staff Positions Differ in Salary

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	33	56	11	0	0
Right Amount	22	32	27	41	0	0
5M						
PM	25	20	52	28	0	0
RA	67	9	54	34	3	0
4M						
PM	46	7	52	35	7	0
RA	137	5	33	59	3	0
5S						
PM	16	13	81	6	0	0
RA	28	21	43	36	0	0
4S						
PM	21	38	57	5	0	0
RA	55	13	67	20	0	0
3						
PM	24	8	50	42	0	0
RA	48	23	61	17	0	0
2						
PM	16	25	31	38	6	0
RA	53	15	53	32	0	0
1						
PM	14	7	29	50	0	14
RA	17	18	29	53	0	0

*Percentages of those who feel:

1. Managerial salary much more
2. Managerial salary slightly more
3. About the same
4. Staff salary slightly more
5. Staff salary much more

TABLE 7.--Engineers' Assessment of the Extent to which Equivalent Managerial and Staff Positions Differ in Effort Required

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	44	22	33	0	0
Right Amount	22	41	32	23	5	0
5M						
PM	25	44	36	16	4	0
RA	65	46	40	12	0	2
4M						
PM	46	37	39	17	7	0
RA	136	40	36	21	1	1
5S						
PM	16	25	31	25	13	6
RA	28	14	18	39	21	7
4S						
PM	22	32	27	32	5	5
RA	55	16	36	38	7	2
3						
PM	24	21	50	21	8	0
RA	48	15	38	35	6	6
2						
PM	16	31	19	38	13	0
RA	55	16	44	31	7	2
1						
PM	14	7	22	57	14	0
RA	17	24	29	35	6	6

*Percentages of those who feel:

1. Much more effort required in managerial
2. Slightly more effort required in managerial
3. About the same
4. Slightly more effort required in staff
5. Much more effort required in staff

TABLE 8.--Engineers' Assessment of the Extent to which Equivalent Managerial and Staff Positions Differ in the Chance to make Important Technical Decisions

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	56	33	11	0	0
Right Amount	22	32	27	14	14	14
5M						
PM	25	16	24	24	28	8
RA	66	24	29	20	21	6
4M						
PM	46	22	39	20	9	11
RA	136	13	42	18	18	10
5S						
PM	16	38	6	19	25	13
RA	28	29	29	11	14	18
4S						
PM	22	41	27	14	14	5
RA	55	24	38	25	5	7
3						
PM	24	21	33	21	21	4
RA	48	21	33	17	23	6
2						
PM	16	25	19	19	25	13
RA	55	13	25	18	29	15
1						
PM	13	23	0	15	38	23
RA	17	6	24	6	29	35

*Percentages of those who feel:

1. Much more chance to make important technical decisions in Managerial
2. Slightly more chance to make important technical decisions in Managerial
3. About the same
4. Slightly more chance to make important technical decisions in Staff
5. Much more chance to make important technical decisions in Staff

TABLE 9.--Engineers' Assessment of the Extent to Which Equivalent Managerial and Staff Positions Differ in Prestige

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	67	33	0	0	0
Right Amount	21	48	33	10	5	5
5M						
PM	25	40	56	4	0	0
RA	67	46	42	12	0	0
4M						
PM	46	41	46	11	0	2
RA	137	34	51	13	2	0
5S						
PM	16	56	38	6	0	0
RA	28	46	39	14	0	0
4S						
PM	22	73	23	0	0	5
RA	55	45	47	5	2	0
3						
PM	24	38	46	13	0	4
RA	47	45	47	6	2	0
2						
PM	16	31	25	31	13	0
RA	55	38	38	16	7	0
1						
PM	14	29	57	7	0	7
RA	17	29	35	24	6	6

*Percentages of those who feel:

1. Much more prestige in managerial
2. Slightly more prestige in managerial
3. About the same
4. Slightly more prestige in staff
5. Much more prestige in staff

TABLE 10.--Engineers' Assessment of the Extent to Which Equivalent Managerial and Staff Positions Differ in Opportunity to Follow Own Interests

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	33	11	11	22	22
Right Amount	22	14	14	32	23	18
5M						
PM	25	4	36	8	24	28
RA	67	8	25	22	30	15
4M						
PM	45	11	24	18	31	16
RA	137	6	20	18	44	12
5S						
PM	16	6	6	19	44	25
RA	28	4	11	11	36	39
4S						
PM	22	27	27	0	41	5
RA	55	5	13	27	31	24
3						
PM	24	4	25	21	42	8
RA	48	8	15	10	48	19
2						
PM	16	19	0	38	19	25
RA	55	4	16	11	51	18
1						
PM	14	0	7	7	36	50
RA	17	6	24	18	24	29

*Percentages of those who feel:

1. Much more opportunity to follow own interests in managerial
2. Slightly more opportunity to follow own interests in managerial
3. About the same
4. Slightly more opportunity to follow own interests in staff
5. Much more opportunity to follow own interests in staff

TABLE 11.--Engineers' Assessment of the Extent to Which Equivalent Managerial and Staff Positions Differ in Ability Required

Occup. Level	Number	1	2	3	4	5
6M						
Prefer More	9	33	11	44	0	11
Right Amount	22	9	14	73	5	0
5M						
PM	25	20	20	44	12	4
RA	66	15	32	45	6	3
4M						
PM	46	24	33	30	2	11
RA	137	12	31	48	6	2
5S						
PM	16	0	31	44	13	13
RA	28	11	18	46	7	18
4S						
PM	22	14	14	45	18	9
RA	55	5	22	62	5	5
3						
PM	24	4	42	50	4	0
RA	47	9	15	60	2	15
2						
PM	16	13	19	56	13	0
RA	55	9	15	51	20	5
1						
PM	14	0	14	36	21	29
RA	17	12	6	47	23	12

*Percentages of those who feel:

1. Much more ability required in managerial
2. Slightly more ability required in managerial
3. About the same
4. Slightly more ability required in staff
5. Much more ability required in staff

TABLE 12.--Engineers' Assessment of the Extent to Which Equivalent Managerial and Staff Positions Differ in Potential for Getting Action on Ideas

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	33	56	11	0	0
Right Amount	22	41	32	23	5	0
5M						
PM	25	32	48	16	4	0
RA	67	30	52	12	6	0
4M						
PM	46	46	43	7	4	0
RA	137	23	52	20	4	0
5S						
PM	16	56	38	0	6	0
RA	28	39	46	11	0	4
4S						
PM	22	45	50	0	5	0
RA	55	35	49	11	5	0
3						
PM	24	29	42	17	13	0
RA	48	19	56	23	0	2
2						
PM	16	31	25	31	13	0
RA	55	16	64	15	5	0
1						
PM	14	21	43	21	7	7
RA	17	12	41	35	6	6

*Percentages of those who feel:

1. Much more potential for getting action on ideas in managerial
2. Slightly more potential for getting action on ideas in managerial
3. About the same
4. Slightly more potential for getting action on ideas in staff
5. Much more potential for getting action on ideas in staff

TABLE 13.--Engineers' Assessment of the Extent to Which Equivalent Managerial and Staff Positions Differ in Excitement

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	44	22	22	11	0
Right Amount	22	27	36	27	5	5
5M						
PM	24	50	29	17	4	0
RA	66	32	33	32	3	0
4M						
PM	46	46	24	17	9	4
RA	137	31	39	22	6	3
5S						
PM	16	19	31	25	19	6
RA	28	18	14	36	14	18
4S						
PM	22	41	18	23	14	5
RA	55	18	13	42	11	16
3						
PM	24	29	25	33	4	8
RA	48	15	25	33	19	8
2						
PM	16	25	31	31	6	6
RA	55	13	38	20	22	7
1						
PM	14	14	7	29	29	21
RA	17	12	18	24	41	6

*Percentages of those who feel:

1. Much more excitement in managerial
2. Slightly more excitement in managerial
3. About the same
4. Slightly more excitement in staff
5. Much more excitement in staff

TABLE 14.--Engineers' Assessment of the Extent to Which Equivalent Managerial and Staff Positions Differ in Potential for Advancement

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	44	44	0	11	0
Right Amount	22	50	27	23	0	0
5M						
PM	25	36	48	12	4	0
RA	67	34	40	24	1	0
4M						
PM	46	52	30	17	0	0
RA	137	23	45	25	7	1
5S						
PM	16	38	56	6	0	0
RA	28	43	39	7	11	0
4S						
PM	22	50	41	9	0	0
RA	55	42	42	15	2	0
3						
PM	24	29	50	21	0	0
RA	48	40	42	17	2	0
2						
PM	16	56	13	19	13	0
RA	55	29	45	25	0	0
1						
PM	14	21	50	21	0	7
RA	17	29	35	29	6	0

*Percentages of those who feel:

1. Much more potential for advancement in managerial
2. Slightly more potential for advancement in managerial
3. About the same
4. Slightly more potential for advancement in staff
5. Much more potential for advancement in staff

TABLE 15.--Engineers' Assessment of the Extent to Which Equivalent Managerial and Staff Positions Differ in Power to Initiate Programs

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	67	22	0	0	11
Right Amount	22	41	41	14	5	0
5M						
PM	25	48	44	8	0	0
RA	67	46	43	4	6	0
4M						
PM	46	54	37	7	2	0
RA	136	34	52	13	1	0
5S						
PM	16	69	25	0	6	0
RA	28	50	39	11	0	0
4S						
PM	22	59	36	5	0	0
RA	55	49	38	13	0	0
3						
PM	24	29	46	25	0	0
RA	48	46	44	8	0	2
2						
PM	16	44	25	25	6	0
RA	55	25	56	16	2	0
1						
PM	14	29	43	0	21	7
RA	17	29	47	18	6	0

*Percentages of those who feel:

1. Much more power to initiate programs in managerial
2. Slightly more power to initiate programs in managerial
3. About the same
4. Slightly more power to initiate programs in staff
5. Much more power to initiate programs in staff

TABLE 16.--Engineers' Opinion on the Degree to Which the Dual Ladder System of Advancement Helps Meet an Engineer's Personal Goals

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	0	11	33	11	44
Right Amount	22	0	5	27	55	14
5M						
PM	24	4	13	13	38	33
RA	67	1	0	19	40	39
4M						
PM	45	2	7	16	27	49
RA	136	1	4	13	46	37
5S						
PM	16	0	13	6	50	31
RA	29	0	3	7	34	55
4S						
PM	22	5	9	14	45	27
RA	55	0	5	16	42	36
3						
PM	24	0	8	13	33	46
RA	47	2	2	17	45	34
2						
PM	16	0	13	6	31	50
RA	55	0	0	4	45	51
1						
PM	14	0	0	7	43	50
RA	18	0	0	11	22	67

*Percentages of those who say:

1. No, it hinders a great deal in meeting these goals
2. No, it hinders somewhat
3. It neither helps nor hinders
4. Yes, it helps somewhat
5. Yes, it helps a great deal in meeting these goals

TABLE 18.--Distribution of Engineers by Work Group Type

Occup. Level	Number		Type of Immediate Work Group									
			1*		2		3		4		5	
	N	%	n	%	n	%	n	%	n	%	n	%
6M												
Prefer More	9	29	5	26	2	50	2	50	0	0	0	0
Right Amount	22	71	14	74	2	50	2	50	2	100	2	100
	31		19		4		4		2		2	
5M												
PM	25	27	7	27	8	31	3	11	1	25	6	55
RA	68	73	19	73	18	69	23	89	3	75	5	45
	93		26		26		26		4		11	
4M												
PM	47	25	9	25	21	32	10	17	0	0	7	37
RA	137	75	27	75	44	68	48	83	6	100	12	63
	184		36		65		58		6		19	
5S												
PM	16	35	3	33	5	45	3	60	4	25	1	25
RA	29	65	6	67	6	55	2	40	12	75	3	75
	45		9		11		5		16		4	
4S												
PM	21	28	3	18	7	29	5	38	5	38	1	12
RA	54	72	14	82	17	71	8	62	8	62	7	88
	75		17		24		13		13		8	
3												
PM	24	33	7	35	4	21	4	23	3	43	6	60
RA	49	67	13	65	15	79	13	77	4	57	4	40
	73		20		19		17		7		10	
2												
PM	16	22	6	26	6	33	3	14	0	0	1	12
RA	56	78	17	74	12	67	18	86	2	100	7	88
	72		23		18		21		2		8	
1												
PM	15	45	1	25	5	42	4	50	1	100	4	50
RA	18	55	3	75	7	58	4	50	0	0	4	50
	33		4		12		8		1		8	

* 1. A complete project
2. A part of a larger project
3. A service group
4. A functional group
5. A product group

TABLE 19.--Highest Educational Attainment of Engineers

Occup. Level	Number	Educational Attainment									
		1*		2		3		4		5	
	N	n	%	n	%	n	%	n	%	n	%
6M	31	0	0	3	4	15	4	10	8	3	13
5M	95	0	0	8	10	61	17	23	17	3	13
4M	184	5	100	43	51	108	30	26	20	2	9
5S	44	0	0	2	2	21	6	12	9	9	39
4S	77	0	0	14	17	40	11	18	14	5	22
3	73	0	0	9	11	45	12	18	14	1	4
2	72	0	0	5	6	45	12	22	16	0	0
1	33	0	0	0	0	29	8	4	3	0	0
TOTAL	609	5	1%	84	14%	364	60%	133	22%	23	4%

* 1. High School
2. Some College
3. Bachelor's Degree
4. Master's Degree
5. Ph.D.

TABLE 20.--Distribution of Engineers by Educational Attainment, Occupational Level, and Work Preference

Occup. Level	Number		Educational Attainment									
			1*		2		3		4		5	
	N	%	n	%	n	%	n	%	n	%	n	%
6M												
Prefer More	9	29	0		0		4	27	3	30	2	67
Right Amount	22	71	0		3	100	11	73	7	70	1	33
	31				3		15		10		3	
5M												
PM	25	26	0		1	13	17	28	6	26	1	33
RA	70	74	0		7	87	44	72	17	74	2	67
	95				8		61		23		3	
4M												
PM	47	26	0		11	26	29	27	6	23	1	50
RA	137	74	5	100	32	74	79	73	20	77	1	50
	184		5		43		108		26		2	
5S												
PM	15	34	0		1	50	11	52	2	17	1	11
RA	29	66	0		1	50	10	48	10	83	8	89
	44				2		21		12		9	
4S												
PM	22	29	0		5	36	13	33	3	17	1	20
RA	55	71	0		9	64	27	67	15	83	4	80
	77				14		40		18		5	
3												
PM	24	33	0		2	22	15	33	7	39	0	
RA	49	66	0		7	78	30	67	11	61	1	100
	73				9		45		18		1	
2												
PM	16	22	0		1	20	12	27	3	14	0	
RA	56	78	0		4	80	33	73	19	86	0	
	72				5		45		22			
1												
PM	15	45	0		0		14	48	1	25	0	
RA	18	55	0		0		15	52	3	75	0	
	33						29		4			

* 1. Up to or including high school
2. Technical school, business school, or some college work
3. Bachelor's degree
4. Master's degree
5. Doctor's degree

TABLE 21.--Engineers' Satisfaction with Advancement Since Starting Work in Organization

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	0	0	22	33	44
Right Amount	22	0	0	9	45	45
5M						
PM	25	0	4	16	56	24
RA	70	3	1	13	40	43
4M						
PM	47	6	13	19	34	28
RA	138	0	4	14	43	38
5S						
PM	16	0	13	13	44	31
RA	27	0	4	11	41	44
4S						
PM	22	5	23	23	32	18
RA	54	0	7	13	48	31
3						
PM	23	4	9	30	43	13
RA	48	0	15	15	42	29
2						
PM	15	7	20	13	53	7
RA	50	0	14	14	54	18
1						
PM	13	15	31	31	23	0
RA	16	6	6	50	25	13

*Percentages of those who feel:

1. Very dissatisfied
2. Fairly dissatisfied
3. So-So
4. Fairly satisfied
5. Very satisfied

TABLE 22.--Engineers' Satisfaction with Their Jobs

Occup. Level	Number	1*	2	3
6M				
Prefer More	9	0	56	44
Right Amount	22	9	41	50
5M				
PM	25	12	80	8
RA	69	0	58	42
4M				
PM	47	2	66	32
RA	138	1	53	46
5S				
PM	16	13	50	38
RA	29	3	48	48
4S				
PM	22	9	64	27
RA	55	2	53	45
3				
PM	24	13	75	13
RA	49	0	57	43
2				
PM	16	13	63	25
RA	56	4	52	45
1				
PM	15	33	53	13
RA	18	17	50	33

*Percentages of those who feel their job to be:

1. Not satisfying
2. Fairly satisfying
3. Very satisfying

TABLE 23.--Engineers' Rating of the Kind of Work They Do

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	11	11	0	44	33
Right Amount	22	0	0	9	50	41
5M						
PM	24	0	25	21	33	21
RA	70	0	1	10	31	57
4M						
PM	47	0	6	13	32	49
RA	138	0	0	9	43	49
5S						
PM	16	0	0	13	63	25
RA	29	0	0	10	48	41
4S						
PM	22	0	0	32	36	32
RA	55	0	2	9	40	49
3						
PM	24	0	8	21	42	29
RA	49	2	0	8	43	47
2						
PM	16	0	6	19	44	31
RA	56	2	0	9	46	43
1						
PM	15	0	7	47	40	7
RA	18	0	17	6	44	33

*Percentages of those who rate the kind of work they do as:

1. Very poor
2. Poor
3. Average
4. Good
5. Very Good

TABLE 24.--Engineers' Opinion on Whether Their Present Work is Helping Them to Achieve Their Important Goals

Occup. Level	Number	1*	2	3
6M				
Prefer More	9	22	56	22
Right Amount	22	5	36	59
5M				
PM	25	24	52	24
RA	70	4	63	33
4M				
PM	47	9	62	30
RA	138	1	59	40
5S				
PM	16	6	75	19
RA	29	0	59	41
4S				
PM	22	14	59	27
RA	55	4	56	40
3				
PM	24	17	79	4
RA	49	8	59	33
2				
PM	16	13	56	31
RA	56	2	64	34
1				
PM	15	20	67	13
RA	18	17	67	17

*Percentages of those who say:

1. No
2. Partially
3. Yes

TABLE 25.--Engineers' Opinion of the Degree to Which His Job Measures Up to What He Wants From a Job

Occup. Level	Number	1*	2	3
6M				
Prefer More	9	33	33	33
Right Amount	22	9	36	55
5M				
PM	25	40	44	16
RA	70	1	51	47
4M				
PM	47	23	55	21
RA	138	2	50	48
5S				
PM	16	6	75	19
RA	29	0	48	52
4S				
PM	22	23	68	9
RA	55	7	40	53
3				
PM	24	29	63	8
RA	49	4	53	43
2				
PM	16	6	69	25
RA	56	2	61	37
1				
PM	15	27	53	20
RA	18	17	44	39

*Percentages of those who feel this to be:

1. Poor
2. Fair
3. Good

TABLE 26.--Engineers' Rating of the Degree to Which He is Involved in Technical Work

Occup. Level	Number	1*	2	3
6M				
Prefer More	9	11	22	67
Right Amount	22	5	45	50
5M				
PM	25	4	64	32
RA	70	3	39	59
4M				
PM	47	4	43	53
RA	136	1	38	61
5S				
PM	15	0	33	67
RA	29	0	34	66
4S				
PM	22	5	55	41
RA	55	2	33	65
3				
PM	24	0	50	50
RA	48	0	46	54
2				
PM	16	0	69	31
RA	56	0	64	36
1				
PM	15	0	73	27
RA	18	0	50	50

*Percentages of those who feel:

1. Not involved
2. Somewhat involved
3. Deeply involved

TABLE 27.--Engineers' Rating of the Importance of Work in Their Lives, Disregarding Economic Necessity

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	11	22	22	33	11
Right Amount	22	5	27	14	55	0
5M						
PM	25	0	8	28	60	4
RA	70	1	6	27	63	3
4M						
PM	47	0	4	28	62	6
RA	138	0	9	35	52	4
5S						
PM	16	0	6	19	75	0
RA	29	0	10	34	48	7
4S						
PM	22	5	0	36	55	5
RA	55	0	7	38	53	2
3						
PM	24	0	8	50	38	4
RA	49	0	6	49	41	4
2						
PM	16	6	0	25	56	13
RA	56	0	4	30	64	2
1						
PM	15	7	7	20	67	0
RA	18	6	6	33	39	17

*Percentages of those who feel:

1. It is of little importance
2. Fairly important
3. Quite important
4. It is extremely important
5. It is the single most important thing

TABLE 28.--Engineers' Rating of Their Jobs on Physical Working Conditions (Space, Light, Noise, Cleanliness, etc.)

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	0	0	11	44	44
Right Amount	22	0	5	14	45	36
5M						
PM	25	0	20	8	32	40
RA	70	1	11	9	37	41
4M						
PM	47	2	9	20	40	28
RA	138	3	10	28	33	26
5S						
PM	16	0	13	19	44	25
RA	29	0	10	38	13	38
4S						
PM	22	0	18	27	36	18
RA	55	5	31	22	25	16
3						
PM	24	0	13	25	25	38
RA	49	0	27	27	33	14
2						
PM	16	6	0	31	63	0
RA	56	0	18	30	39	13
1						
PM	15	0	7	20	27	47
RA	18	0	11	39	33	17

*Percentages of those who feel this factor to be:

1. Very poor
2. Poor
3. Average
4. Good
5. Very good

TABLE 29.--Engineers' Rating of Their Salaries Considering Their Duties and Responsibilities

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	0	0	44	22	33
Right Amount	22	0	0	27	50	23
5M						
PM	25	0	8	20	60	12
RA	70	0	4	30	41	24
4M						
PM	47	2	11	34	38	15
RA	138	1	8	41	40	11
5S						
PM	16	0	0	31	31	38
RA	29	0	0	17	45	38
4S						
PM	22	0	9	36	36	18
RA	55	0	2	29	60	9
3						
PM	24	0	0	25	50	25
RA	49	0	6	33	43	18
2						
PM	16	0	6	56	31	6
RA	56	2	2	46	48	2
1						
PM	15	0	13	20	53	13
RA	18	0	0	39	39	22

*Percentages of those who feel this factor to be:

1. Very poor
2. Poor
3. Average
4. Good
5. Very good

TABLE 30.--Engineers' Rating of Their Salaries Considering What They Could Get for the Same Work at Other Companies

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	0	0	44	33	22
Right Amount	22	0	5	32	41	23
5M						
PM	25	0	12	36	40	12
RA	69	0	6	35	46	13
4M						
PM	47	4	11	34	34	17
RA	137	1	7	45	35	11
5S						
PM	16	0	0	31	38	31
RA	29	0	0	31	45	24
4S						
PM	22	5	5	36	41	14
RA	55	0	5	33	56	5
3						
PM	24	0	0	46	29	25
RA	49	0	8	33	47	12
2						
PM	16	0	0	50	44	6
RA	56	2	4	54	39	2
1						
PM	15	0	13	47	33	7
RA	18	0	0	50	28	22

*Percentages of those who feel this factor to be:

1. Very poor
2. Poor
3. Average
4. Good
5. Very good

TABLE 31.--Engineers' Rating of Their Opportunities to Move to a Better Job in the Future

Occup. Level	Number	1*	2	3	4	5
6M						
Prefer More	9	11	22	33	22	11
Right Amount	22	0	5	32	50	14
5M						
PM	25	8	32	8	48	4
RA	70	0	9	26	44	21
4M						
PM	47	0	19	38	30	12
RA	138	1	11	30	42	17
5S						
PM	16	0	0	38	50	13
RA	29	0	10	21	62	7
4S						
PM	22	5	9	45	36	5
RA	54	0	9	33	43	15
3						
PM	24	4	21	42	25	8
RA	49	0	10	35	37	18
2						
PM	16	0	6	38	25	31
RA	56	0	2	18	61	20
1						
PM	15	0	13	40	33	13
RA	17	0	6	18	53	24

*Percentages of those who feel this to be:

1. Very poor
2. Poor
3. Average
4. Good
5. Very good

TABLE 32.--Engineers' Rating of the Intellectual Demands of Their Present Jobs

Occup. Level	Number	1*	2	3	4	5	6
6M							
Prefer More	9	11	11	11	22	44	0
Right Amount	22	0	0	9	27	50	14
5M							
PM	25	4	8	40	32	16	0
RA	70	1	3	16	34	41	4
4M							
PM	47	2	11	32	36	19	0
RA	138	0	4	20	36	36	4
5S							
PM	16	0	0	56	31	13	0
RA	29	0	3	3	41	45	7
4S							
PM	22	5	27	23	32	9	5
RA	55	0	4	15	31	44	7
3							
PM	24	4	33	16	25	21	0
RA	48	0	0	21	42	35	2
2							
PM	16	0	19	38	25	13	6
RA	56	4	2	25	41	29	0
1							
PM	15	7	27	47	20	0	0
RA	18	11	0	17	44	28	0

*Percentages of those who feel these demands are:

1. Extremely light
2. Quite light
3. Slightly light
4. Slightly heavy
5. Quite heavy
6. Extremely heavy

TABLE 33.--Engineers' Opinion on Whether Their Work During the Past Year Could Have Been Handled by Someone with Less Technical Training

Occup. Level	Number	1*	2
6M			
Prefer More	9	78	22
Right Amount	22	41	59
5M			
PM	25	76	24
RA	68	43	57
4M			
PM	46	70	30
RA	133	35	66
5S			
PM	16	50	50
RA	29	45	55
4S			
PM	22	82	18
RA	55	51	49
3			
PM	23	74	26
RA	47	70	30
2			
PM	16	88	12
RA	56	70	30
1			
PM	15	100	0
RA	18	56	44

*Percentages of those who say:

1. Yes
2. No

TABLE 34.--Engineers' Opinion on Whether there is Considerable Improper Utilization of People in Their Kind of Work with Professional People Working on Details Others Could Handle

Occup. Level	Number	1*	2	3
6M				
Prefer More	9	11	56	33
Right Amount	22	27	64	9
5M				
PM	25	0	60	40
RA	67	21	69	11
4M				
PM	47	6	68	26
RA	137	23	65	13
5S				
PM	16	25	56	19
RA	29	21	58	21
4S				
PM	21	5	67	29
RA	53	15	62	23
3				
PM	24	13	58	29
RA	49	10	76	14
2				
PM	16	6	69	25
RA	55	22	65	13
1				
PM	15	13	60	27
RA	18	22	72	6

*Percentages of those who:

1. Disagree
2. Agree Partly
3. Agree Fully

APPENDIX C

FACTOR ANALYSIS OF THE QUESTIONS CONTAINED IN THE "PERSONAL GOALS DESCRIPTION" SECTION OF THE QUESTIONNAIRE AND SELECTION OF QUESTIONS USED IN THE PERSONAL GOALS INVESTIGATION

Factor Analysis of the Personal Goals Section of the Questionnaire

The following is a presentation of the results of a factor analysis performed on the questions making up the "Personal Goals Description" section of the questionnaire. The questions have been placed in order of decreasing value of their factor loading.

Next Highest	Factor Loading	
		FACTOR I
-03	61	Publish articles in technical journals
-05	58	Communicate your ideas to others in your profession through papers delivered at professional meetings
-11	43	Establish a reputation outside the company as an authority in your field
-17	29	Receive patents on your technical ideas
35	24	Be evaluated only on the basis of your technical contributions
19	15	Teach and guide others in technical activities
		FACTOR II
-14	44	Have the opportunity to explore new ideas about technology or systems
-14	43	Have the opportunity to work on complex technical problems
-03	42	Work on projects that utilize the latest theoretical results in your specialty

Next Highest	Factor Loading	
-05	40	Work on projects that require learning new technical knowledge
-12	34	Work with others who are outstanding in their technical achievements
-17	28	Advance to a high level staff technical position
38	22	Participate in decisions that set the direction of technical effort in the company
-14	22	Be known in the company as an expert in your field of specialty
42	18	Work on problems that have practical applications important to your company
19	17	Follow your own theoretical interests whether or not they promise a "payoff" for the company
32	16	Have someone to guide your technical efforts
		FACTOR III
-05	66	Make a great deal of money
-06	65	Make more money than the "average" college graduate
-05	62	Receive better than average salary increases
28	17	Advance to a high level staff technical position
34	17	Live in a location and community that is desirable to you and your family
		FACTOR IV
-04	61	Learn administrative methods and procedures
-06	60	Become a first-line manager in your line of work
-11	56	While you may have already been promoted to either a managerial position or a staff professional position, if you had your choice, would you rather be a manager of a group or a staff professional at a similar level (for example, be a project level manager or a staff level professional)?

Next Highest	Factor Loading	
-11	51	Advance to a policy-making position in management
-20	41	Be the technical leader of a group of less experienced professionals
-22	41	Learn how the business is set up and run
-24	-35	Be evaluated only on the basis of your technical contributions
26	25	Gain knowledge of company management policies and practices
-15	19	Teach and guide others in technical activities
40	19	Participate in decisions that affect the future business of the company
33	21	Keep informed on what your company is doing
20	16	Have the opportunity to discuss the results of your work directly with those in higher management
		FACTOR V
-12	54	Work on projects that have a direct impact on the business success of your company
-03	47	Have the opportunity to help the company increase its profits
-18	42	Work on problems that have practical applications important to your company
-18	40	Participate in decisions that affect the future business of the company
-19	38	Have the opportunity to help the company build its reputation as a first-class organization
-22	38	Participate in decisions that set the direction of technical effort in the company
-08	37	Know what the goals of your division are
-19	33	Work on problems that are of special interest to higher management

Next Highest	Factor Loading	
-21	33	Keep informed on what your company is doing
-13	28	Have the opportunity to see the concrete results of what you have done
-25	26	Gain knowledge of company management policies and practices
-41	22	Learn how the business is set up and run
-16	20	Have the opportunity to discuss the results of your work directly with those in higher management
29	17	Receive patents on your technical ideas
		FACTOR VI
-03	69	Have little tension and stress on the job
-04	68	Have few worries, tensions and troubles
-12	43	Be given clear, detailed instructions as to how to proceed with the job
-14	40	Work in a well-ordered job situation where the requirements are clear
-16	32	Have someone to guide your technical efforts
43	24	Have stability in your life and work
-17	19	Follow your own theoretical interests whether or not they promise a "payoff" for the company
		FACTOR VII
-11	44	Have adequate retirement, health insurance and other company benefits
-24	43	Have stability in your life and work
-17	34	Live in a location and community that is desirable to you and your family
-11	25	Work in a cooperative, friendly atmosphere
-13	23	Make all the decisions on matters directly concerning your technical responsibility

Next Highest	Factor Loading	
-16	22	Have freedom to adopt your own approach to the job
40	20	Be the technical leader of a group of less experienced professionals
-13	20	Work for a company whose reputation is respected by others in your field
33	-19	Work on problems that are of special interest to management
19	15	Teach and guide others in technical activities

FACTOR INTERCORRELATIONS

	II	III	IV	V	VI	VII
I	58	-02	08	13	17	-17
II	--	24	-17	07	-23	19
III		--	43	06	08	-06
IV			--	36	-17	-16
V				--	-09	53
VI					--	37
VII						--

Selection of Questions Used in Personal Goals Investigation

The factor loading, determined through factor analysis, of each of the questions was considered. Those questions with low factor loadings were dropped from the analysis. A high factor loading indicates that the question is a better measure of the factor to which it is related. Therefore, the questions with low factor loadings can be dropped without damaging the measure of the factor in question.

Of the original fifty questions administered to the engineers, thirty-nine were selected for use in this study. These questions are listed under the names that have been selected to describe the factors.

For uniformity, the factor names used by the Corporation's Personnel Research Staff in previous studies have been adopted. The questions used to investigate the personal goals of the engineers are presented below.

Each of the questions is preceded by the clause, "How important is it to you to . . . "

I. Scientific Goals

1. Publish articles in technical journals
2. Establish a reputation outside the company as an authority in your field
3. Communicate your ideas to others in your profession through papers delivered at professional meetings

II. Technical Goals

1. Have the opportunity to explore new ideas about technology or systems
2. Have the opportunity to work on complex technical problems
3. Work on projects that utilize the latest theoretical results in your specialty
4. Work on projects that require learning new technical knowledge
5. Work with others who are outstanding in their technical achievements

III. Monetary Goals

1. Make a great deal of money
2. Make more money than the "average" college graduate
3. Receive better-than-average salary increases

IV. Managerial Goals

1. Learn administrative methods and procedures
2. Become a first-line manager in your line of work
3. While you may already have been promoted to either a managerial position or a staff professional position, if you had your choice, would you rather be a manager of a group or a staff professional at a similar level (for example, be a project level manager or a staff level professional).

    (1) I would much rather be a manager
    (2) I would somewhat rather be a manager
    (3) It doesn't make any difference
    (4) I would somewhat rather be a staff professional
    (5) I would much rather be a staff professional

4. Advance to a policy-making position in management
5. Be the technical leader of a group of less experienced professionals

6. Learn how the business is set up and run
7. (-) Be evaluated only on the basis of your technical contributions

V. Company Affiliation

1. Work on projects that have a direct impact on the business success of your company
2. Have the opportunity to help the company increase its profits
3. Work on problems that have practical applications important to your company
4. Participate in decisions that affect the future business of the company
5. Have the opportunity to help the company build its reputation as a first-class organization
6. Participate in decisions that set the direction of technical effort in the company
7. Know what the goals of your division are

VI. Dependency Goals

1. Have little tension and stress on the job
2. Have few worries, tensions, and troubles
3. Be given clear, detailed instructions as to how to proceed with the job
4. Work in a well-ordered job situation where the requirements are clear

VII. Security and Good Life

1. Have adequate retirement, health insurance, and other company benefits
2. Have stability in your life and work
3. Live in a location and community that is desirable to you and your family
4. Work in a cooperative, friendly atmosphere

VIII. Autonomy

1. Make all the decisions on matters directly concerning your technical responsibility
2. Be individually responsible for technical projects (rather than work with a group)

IX. Staff Position

1. Advance to a high level staff technical position

X. Power Goals

1. Participate in decisions that affect the future business of the company
2. Participate in decisions that set the direction of technical effort in the company

APPENDIX D

Tables 35-69

TABLE 35.--Engineer's Rating of the Importance to Him of Establishing a Reputation Outside the Company as an Authority in His Field

Occup. Level	Number	1*	2	3
6M Total	38	18	55	26
Prefer More	9	22	22	56
Right Amount	22	18	68	14
5M	114	17	64	19
PM	25	8	68	19
RA	70	17	66	17
4M	233	21	62	18
PM	47	19	66	15
RA	138	23	62	16
5S	50	10	50	40
PM	16	19	56	25
RA	29	7	45	8
4S	84	20	55	25
PM	22	18	45	36
RA	55	16	62	22
3	81	17	53	30
PM	24	21	50	29
RA	49	18	51	31
2	79	14	58	28
PM	16	6	56	38
RA	56	14	67	25
1	35	14	46	40
PM	15	7	40	53
RA	18	17	50	33

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 36.--Engineer's Rating of the Importance to Him of Publishing Articles in Technical Journals

Occup. Level	Number	1*	2	3
6M Total	38	47	37	16
Prefer More	9	44	22	33
Right Amount	22	50	41	9
5M	113	36	56	8
PM	25	20	68	12
RA	69	39	55	6
4M	232	41	51	8
PM	47	34	57	9
RA	137	44	47	9
5S	50	22	50	28
PM	16	25	69	6
RA	29	21	38	41
4S	83	33	53	14
PM	21	10	71	19
RA	55	38	49	13
3	81	26	53	21
PM	24	25	63	13
RA	49	31	45	25
2	79	19	48	12
PM	16	19	56	25
RA	56	23	63	14
1	35	23	63	14
PM	15	0	87	13
RA	18	39	50	11

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 37.--Engineer's Rating of the Importance to Him of Communicating His Ideas to Others in His Profession Through Papers Delivered at Professional Meetings

Occup. Level	Number	1*	2	3
6M Total	38	42	39	18
Prefer More	9	44	11	44
Right Amount	22	41	50	9
5M	112	40	48	12
PM	25	32	52	16
RA	68	38	51	10
4M	231	41	48	10
PM	47	32	62	6
RA	136	44	43	13
5S	50	22	56	22
PM	16	25	75	0
RA	29	21	48	31
4S	84	27	63	10
PM	22	9	82	9
RA	55	29	62	9
3	81	23	56	21
PM	24	25	58	17
RA	49	27	51	22
2	79	24	63	13
PM	16	25	56	19
RA	56	25	64	11
1	35	26	60	14
PM	15	13	73	13
RA	18	33	56	11

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 38.-- Engineer's Rating of the Importance to Him of Having the Opportunity to Explore New Ideas about Technology or Systems

Occup. Level	Number	1*	2	3
6M Total	38	0	29	71
Prefer More	9	0	22	78
Right Amount	22	0	32	68
5M	112	3	41	56
PM	25	0	40	60
RA	68	2	43	56
4M	231	3	45	52
PM	47	9	32	60
RA	138	1	49	50
5S	50	0	30	70
PM	16	0	31	69
RA	29	0	24	76
4S	84	1	37	62
PM	22	0	36	64
RA	55	2	36	62
3	81	4	33	63
PM	24	0	25	75
RA	49	6	35	59
2	79	1	37	62
PM	16	6	38	56
RA	56	0	38	63
1	35	6	34	60
PM	15	0	13	87
RA	18	6	56	39

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 39.--Engineer's Rating of the Importance to Him of Having the Opportunity to Work on Complex Technical Problems

Occup. Level	Number	1*	2	3
6M Total	38	8	50	42
Prefer More	9	22	33	44
Right Amount	22	5	56	41
5M	113	5	56	39
PM	25	4	44	52
RA	69	4	58	38
4M	231	6	58	36
PM	47	2	47	51
RA	138	7	63	30
5S	50	0	48	52
PM	16	0	50	50
RA	29	0	45	55
4S	84	5	44	51
PM	22	0	45	55
RA	55	7	42	51
3	81	2	43	54
PM	24	0	50	50
RA	49	4	41	55
2	79	3	48	49
PM	16	6	31	63
RA	56	2	59	39
1	35	9	40	51
PM	15	13	27	60
RA	18	0	50	50

*Percentages of those who feel this factor to be of:

1. Little Importance
2. Fair importance
3. Great importance

TABLE 40.--Engineer's Rating of the Importance to Him of Working with Others Who are Outstanding in Their Technical Achievements

Occup. Level	Number	1*	2	3
6M Total	38	0	50	50
Prefer More	9	0	56	44
Right Amount	22	0	50	50
5M	113	2	51	47
PM	25	0	44	56
RA	69	0	57	43
4M	233	6	53	41
PM	47	9	30	62
RA	138	3	60	37
5S	50	2	48	50
PM	16	6	75	19
RA	29	0	31	69
4S	84	2	51	46
PM	22	0	59	41
RA	55	4	49	47
3	81	1	47	52
PM	24	0	50	50
RA	49	2	45	53
2	79	4	51	46
PM	16	19	31	50
RA	56	0	55	45
1	35	3	34	63
PM	15	0	20	80
RA	18	6	39	56

*Percentages of those who feel this factor to be of:

1. Little Importance
2. Fair importance
3. Great Importance

TABLE 41.--Engineer's Rating of the Importance to Him of Working on Projects that Require Learning New Technical Knowledge

Occup. Level	Number	1*	2	3
6M Total	38	3	66	32
Prefer More	9	0	67	33
Right Amount	22	0	68	32
5M	113	4	67	29
PM	25	4	68	28
RA	69	1	68	30
4M	233	4	60	36
PM	47	4	47	49
RA	138	3	64	33
5S	50	0	60	40
PM	16	0	63	38
RA	29	0	59	41
4S	84	0	63	37
PM	22	0	55	45
RA	55	0	65	35
3	81	0	49	51
PM	24	0	33	67
RA	49	0	55	45
2	79	1	49	49
PM	16	6	19	75
RA	56	0	59	41
1	35	3	37	60
PM	15	0	40	60
RA	18	6	33	61

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 42.--Engineer's Rating of the Importance to Him of Working on Projects that Utilize the Latest Theoretical Results in His Specialty

Occup. Level	Number	1*	2	3
6M Total	38	8	66	26
Prefer More	9	11	56	33
Right Amount	22	9	68	23
5M	111	13	63	24
PM	25	4	76	20
RA	67	12	60	28
4M	231	11	65	24
PM	47	4	64	32
RA	138	11	67	22
5S	50	2	58	40
PM	16	0	63	37
RA	29	3	55	41
4S	84	5	62	33
PM	22	0	64	36
RA	55	7	64	29
3	81	5	59	36
PM	24	4	58	38
RA	49	6	57	37
2	79	9	65	27
PM	16	6	75	19
RA	56	11	63	27
1	35	9	46	46
PM	15	7	33	60
RA	18	6	56	39

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 43.--Engineer's Rating of the Importance to Him of Making A Great Deal of Money

Occup. Level	Number	1*	2	3
6M Total	38	3	55	42
Prefer More	9	11	33	56
Right Amount	22	0	59	41
5M	113	12	64	25
PM	25	12	60	28
RA	69	12	62	26
4M	233	10	61	29
PM	47	13	60	28
RA	138	9	63	28
5S	50	12	70	18
PM	16	19	75	6
RA	29	10	66	24
4S	84	11	76	13
PM	22	9	68	23
RA	55	13	78	9
3	81	10	59	31
PM	24	12	67	21
RA	49	8	55	37
2	79	9	68	23
PM	16	6	69	25
RA	56	9	66	25
1	35	9	54	37
PM	15	13	47	40
RA	18	0	66	33

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 44.-- Engineer's Rating of the Importance to Him of Making More Money than the "Average" College Graduate

Occup. Level	Number	1*	2	3
6M Total	38	5	32	63
Prefer More	9	11	0	89
Right Amount	22	5	46	50
5M	113	10	52	38
PM	25	12	48	40
RA	69	9	49	42
4M	232	7	45	48
PM	47	11	43	47
RA	137	8	45	47
5S	50	10	56	34
PM	16	6	56	38
RA	29	14	52	34
4S	84	7	52	40
PM	22	9	50	41
RA	55	7	56	36
3	81	10	51	40
PM	24	8	54	38
RA	49	8	51	41
2	79	8	49	43
PM	16	6	50	44
RA	56	7	48	45
1	34	3	65	32
PM	15	0	60	40
RA	17	6	65	29

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 45.--Engineer's Rating of the Importance to Him of Receiving Better-than-Average Salary Increases

Occup. Level	Number	1*	2	3
6M Total	38	0	42	58
Prefer More	9	0	0	100
Right Amount	22	0	64	36
5M	114	3	46	52
PM	25	0	44	51
RA	70	3	46	51
4M	233	0	40	59
PM	47	0	36	64
RA	138	0	42	58
5S	50	4	46	50
PM	16	6	38	56
RA	29	3	52	45
4S	84	1	52	46
PM	22	0	50	50
RA	55	2	55	44
3	81	1	54	44
PM	24	0	67	33
RA	49	2	49	49
2	79	0	47	53
PM	16	0	50	50
RA	56	0	46	54
1	35	0	46	54
PM	15	0	27	73
RA	18	0	61	39

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 46.--Engineer's Rating of the Importance to Him of Becoming A First-line Manager in His Line of Work

Occup. Level	Number	1	2	3
6M Total	37	11	27	62
Prefer More	9	0	11	89
Right Amount	22	18	27	55
5M	94	7	31	62
PM	22	14	27	59
RA	56	5	34	61
4M	211	3	33	64
PM	45	2	31	67
RA	125	3	32	65
5S	49	35	31	35
PM	15	27	20	53
RA	29	41	34	24
4S	84	19	45	36
PM	22	9	41	50
RA	55	25	49	25
3	81	14	42	44
PM	24	13	38	50
RA	49	14	45	41
2	79	11	43	46
PM	16	13	38	50
RA	56	9	46	45
1	35	26	40	34
PM	15	20	33	47
RA	18	33	39	28

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 47.--Engineer's Rating of the Importance to Him of Learning How the Business is Set Up and Run

Occup. Level	Number	1*	2	3
6M Total	38	5	34	61
Prefer More	9	0	11	89
Right Amount	22	5	36	59
5M	111	0	44	56
PM	25	0	48	52
RA	68	0	43	57
4M	232	1	44	55
PM	47	0	40	60
RA	138	1	46	53
5S	50	10	56	34
PM	16	6	50	44
RA	29	14	62	24
4S	84	7	54	39
PM	22	0	59	41
RA	55	11	53	36
3	81	9	47	44
PM	24	8	38	54
RA	49	10	47	43
2	79	5	51	44
PM	16	0	56	44
RA	56	5	50	45
1	35	9	54	37
PM	15	13	40	47
RA	18	6	61	33

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 48.--Engineer's Rating of the Importance to Him of Advancing to a Policy-Making Position in Management

Occup. Level	Number	1*	2	3
6M Total	38	5	29	66
Prefer More	9	0	11	89
Right Amount	22	6	32	64
5M	114	7	49	44
PM	25	0	44	56
RA	70	10	49	41
4M	231	8	45	47
PM	46	9	37	54
RA	137	9	46	45
5S	50	24	48	28
PM	16	19	44	38
RA	29	28	48	24
4S	84	19	61	20
PM	22	5	68	27
RA	55	27	62	11
3	81	12	62	26
PM	24	4	67	29
RA	49	16	57	27
2	79	10	54	35
PM	16	19	25	56
RA	56	7	61	32
1	35	26	49	26
PM	15	13	53	33
RA	18	33	50	17

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 49.--Engineer's Rating of the Importance to Him of Learning Administrative Methods and Procedures

Occup. Level		Number	1*	2	3
6M	Total	38	21	53	26
	Prefer More	9	0	78	22
	Right Amount	22	32	45	23
5M		113	11	58	31
	PM	25	12	52	36
	RA	69	10	57	33
4M		233	8	52	40
	PM	47	6	49	45
	RA	138	7	56	37
5S		50	20	56	24
	PM	16	19	44	38
	RA	29	21	62	17
4S		84	17	52	31
	PM	22	9	45	45
	RA	55	20	58	22
3		81	12	57	31
	PM	24	8	50	42
	RA	49	14	55	31
2		79	6	65	29
	PM	16	6	56	38
	RA	56	6	70	25
1		34	24	47	29
	PM	15	13	53	33
	RA	17	29	41	29

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 50.--Engineer's Rating of the Importance to Him of Being the Technical Leader of a Group of Less Experienced Professionals

Occup. Level	Number	1	2	3
6M Total	37	8	51	41
Prefer More	9	11	33	56
Right Amount	21	10	57	33
5M	113	7	61	32
PM	25	4	56	40
RA	69	4	62	33
4M	233	7	55	39
PM	47	9	51	40
RA	138	5	58	39
5S	50	8	54	38
PM	16	6	38	56
RA	29	10	62	28
4S	84	6	58	36
PM	22	5	59	36
RA	55	7	60	33
3	81	7	53	40
PM	24	8	54	38
RA	49	10	51	39
2	79	11	51	38
PM	16	19	31	50
RA	56	7	55	38
1	35	23	63	14
PM	15	20	53	27
RA	18	28	67	6

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 51.--Engineer's Rating of the Importance to Him of Being Evaluated Only on the Basis of His Technical Contributions

Occup. Level	Number	1*	2	3
6M Total	38	55	42	3
Prefer More	9	56	44	0
Right Amount	22	55	41	5
5M	112	41	54	4
PM	25	28	56	16
RA	68	47	51	1
4M	231	41	54	5
PM	47	40	55	4
RA	136	40	55	4
5S	49	16	59	24
PM	16	13	69	19
RA	28	18	57	25
4S	84	20	70	10
PM	22	18	64	18
RA	55	16	76	7
3	81	25	58	17
PM	24	38	42	21
RA	49	20	63	16
2	79	20	73	6
PM	16	25	63	13
RA	56	18	77	5
1	35	26	57	17
PM	15	13	53	33
RA	18	33	61	6

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 52.--Engineer's Rating of the Importance to Him of Working on Problems that Have Practical Applications Important to His Company

Occup. Level	Number	1*	2	3
6M Total	38	0	18	82
Prefer More	9	0	22	78
Right Amount	22	0	18	82
5M	114	0	22	78
PM	25	0	24	76
RA	70	0	16	84
4M	232	0	33	66
PM	47	2	30	68
RA	138	0	34	66
5S	50	2	34	64
PM	16	0	19	81
RA	29	3	41	55
4S	84	0	23	77
PM	22	0	18	82
RA	55	0	27	73
3	81	2	33	64
PM	24	0	29	71
RA	49	4	35	61
2	79	0	32	68
PM	16	0	19	81
RA	56	0	38	63
1	35	3	29	69
PM	15	0	20	80
RA	18	0	33	67

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 53.--Engineer's Rating of the Importance to Him of Having the Opportunity to Help the Company Build its Reputation as a First-Class Organization

Occup. Level	Number	1*	2	3
6M Total	38	3	16	82
Prefer More	9	0	11	90
Right Amount	22	5	18	77
5M	114	0	24	76
PM	25	0	24	76
RA	70	0	23	77
4M	233	0	29	70
PM	47	0	21	79
RA	138	1	34	65
5S	50	2	22	76
PM	16	0	38	63
RA	29	3	17	79
4S	84	0	27	73
PM	22	0	27	73
RA	55	0	29	71
3	81	0	28	72
PM	24	0	33	67
RA	49	0	24	76
2	79	0	34	66
PM	16	0	13	87
RA	56	0	41	59
1	35	3	37	60
PM	15	0	33	67
RA	18	6	33	61

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 54.--Engineer's Rating of the Importance to Him of Having the Opportunity to Help the Company Increase its Profits

Occup. Level	Number	1*	2	3
6M Total	38	0	24	76
Prefer More	9	0	0	100
Right Amount	22	0	32	68
5M	114	1	27	72
PM	25	0	8	92
RA	70	1	29	70
4M	232	0	31	69
PM	46	0	20	80
RA	138	0	38	62
5S	50	2	30	68
PM	16	0	44	56
RA	29	3	24	72
4S	84	0	32	68
PM	22	0	23	77
RA	55	0	40	60
3	81	2	30	68
PM	24	0	29	71
RA	49	4	27	69
2	79	0	30	70
PM	16	0	19	81
RA	56	0	34	66
1	35	6	49	46
PM	15	7	40	53
RA	18	6	50	44

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 55.--Engineer's Rating of the Importance to Him of Knowing What the Goals of His Division Are

Occup. Level	Number	1*	2	3
6M Total	38	3	18	79
Prefer More	9	0	0	100
Right Amount	22	5	18	77
5M	114	0	37	63
PM	25	0	36	64
RA	70	0	31	69
4M	231	0	35	65
PM	47	0	21	79
RA	136	0	40	60
5S	50	2	36	62
PM	16	0	31	69
RA	29	3	41	55
4S	84	1	36	63
PM	22	0	14	86
RA	55	2	45	53
3	81	1	52	47
PM	24	0	50	50
RA	49	2	55	43
2	79	0	41	59
PM	16	0	44	56
RA	56	0	38	63
1	35	3	40	57
PM	15	0	33	67
RA	18	6	39	56

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 56.--Engineer's Rating of the Importance to Him of Working on Projects that Have a Direct Impact on the Business Success of His Company

Occup. Level	Number	1*	2	3
6M Total	38	0	32	68
Prefer More	9	0	0	100
Right Amount	22	0	45	55
5M	114	0	43	57
PM	25	0	36	64
RA	70	0	44	56
4M	233	1	49	50
PM	47	0	43	57
RA	138	1	55	43
5S	50	2	46	52
PM	16	0	38	63
RA	29	3	48	48
4S	84	4	35	62
PM	22	0	27	73
RA	55	4	40	56
3	81	4	48	48
PM	24	0	42	58
RA	49	6	49	45
2	79	3	56	42
PM	16	0	50	50
RA	56	4	59	38
1	35	6	51	43
PM	15	0	60	40
RA	18	11	44	44

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 57.--Engineer's Rating of the Importance to Him of Participating in Decisions that Set the Direction of Technical Effort in the Company

Occup. Level	Number	1*	2	3
6M Total	38	3	45	53
Prefer More	9	11	22	67
Right Amount	22	0	56	45
5M	112	2	58	40
PM	25	4	40	56
RA	68	1	60	38
4M	230	5	54	41
PM	47	0	49	51
RA	137	7	58	34
5S	50	2	54	44
PM	16	0	31	69
RA	29	3	66	31
4S	84	6	54	40
PM	22	0	55	45
RA	55	9	55	36
3	81	5	67	33
PM	24	8	50	42
RA	49	4	67	29
2	79	3	62	35
PM	16	0	56	44
RA	56	4	63	34
1	35	17	51	31
PM	15	13	47	40
RA	18	17	56	29

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 58.--Engineer's Rating of the Importance to Him of Participating in Decisions that Affect the Future Business of the Company

Occup. Level	Number	1	2	3
6M Total	38	3	37	61
Prefer More	9	11	11	78
Right Amount	22	0	45	55
5M	114	1	49	50
PM	25	0	40	60
RA	70	1	49	50
4M	231	3	49	48
PM	47	2	40	57
RA	138	1	53	46
5S	50	2	52	46
PM	16	0	44	56
RA	29	3	59	38
4S	84	5	51	44
PM	22	0	50	50
RA	55	7	55	38
3	81	6	61	33
PM	24	0	79	21
RA	49	10	51	39
2	78	4	56	40
PM	16	6	50	44
RA	56	4	59	38
1	35	9	54	37
PM	15	13	33	53
RA	18	6	67	28

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 59.--Engineer's Rating of the Importance to Him of Having Little Tension and Stress on the Job

Occup. Level	Number	1*	2	3
6M Total	38	26	58	16
Prefer More	9	33	56	11
Right Amount	22	27	56	18
5M	114	30	58	12
PM	25	36	48	16
RA	70	29	63	9
4M	233	29	60	11
PM	47	51	43	6
RA	138	22	68	9
5S	50	28	52	20
PM	16	38	38	25
RA	29	14	66	21
4S	84	30	49	21
PM	22	41	36	23
RA	55	24	56	20
3	81	32	57	11
PM	24	46	46	8
RA	49	29	61	10
2	79	25	62	13
PM	16	31	50	19
RA	56	23	64	13
1	35	29	54	17
PM	15	40	40	20
RA	18	22	67	11

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 60.--Engineer's Rating of the Importance to Him of Having Few Worries, Tensions and Troubles

Occup. Level	Number	1*	2	3
6M Total	38	29	55	16
Prefer More	9	44	44	11
Right Amount	22	23	56	23
5M	114	18	66	17
PM	25	24	52	24
RA	70	16	70	14
4M	233	21	66	13
PM	47	36	60	4
RA	138	18	68	14
5S	50	14	64	22
PM	16	25	56	19
RA	29	10	66	24
4S	84	23	58	19
PM	22	27	55	18
RA	55	20	62	18
3	81	19	58	23
PM	24	25	54	21
RA	49	18	57	24
2	79	19	63	18
PM	16	31	50	19
RA	56	14	66	20
1	35	14	63	23
PM	15	20	60	20
RA	18	11	67	22

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 61.--Engineer's Rating of the Importance to Him of Working in a Well-Ordered Job Situation Where the Requirements are Clear

Occup. Level	Number	1*	2	3
6M Total	38	29	66	5
Prefer More	9	33	56	11
Right Amount	22	23	73	5
5M	114	22	66	12
PM	25	28	68	4
RA	70	21	64	14
4M	233	18	65	17
PM	47	30	57	13
RA	138	14	70	16
5S	50	22	62	16
PM	16	31	56	13
RA	29	14	66	21
4S	84	14	68	18
PM	22	9	82	9
RA	55	15	64	22
3	81	19	59	22
PM	24	21	58	21
RA	49	16	61	22
2	79	11	68	20
PM	16	25	63	13
RA	56	7	70	23
1	35	9	46	46
PM	15	13	33	53
RA	18	6	56	39

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 62.--Engineer's Rating of the Importance to Him of Being Given Clear Detailed Instructions as to How to Proceed with the Job

Occup. Level	Number	1*	2	3
6M Total	38	61	39	0
Prefer More	9	56	44	0
Right Amount	22	59	41	0
5M	114	48	50	2
PM	25	52	48	0
RA	70	49	50	1
4M	233	31	63	6
PM	47	40	53	6
RA	138	25	68	7
5S	50	40	50	10
PM	16	31	56	13
RA	29	48	41	10
4S	84	33	56	11
PM	22	27	59	14
RA	55	35	56	9
3	81	43	51	6
PM	24	54	42	4
RA	49	39	55	6
2	79	39	58	3
PM	16	56	38	6
RA	56	29	70	2
1	35	23	69	8
PM	15	27	67	7
RA	18	22	67	11

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 63.--Engineer's Rating of the Importance to Him of Living in a Location and Community that is Desirable to Him and His Family

Occup. Level	Number	1*	2	3
6M Total	38	0	18	82
Prefer More	9	0	22	78
Right Amount	22	0	23	77
5M	114	0	18	82
PM	25	0	20	80
RA	70	0	17	83
4M	233	0	19	80
PM	47	0	23	77
RA	138	0	19	81
5S	50	4	22	74
PM	16	6	44	50
RA	29	3	7	90
4S	84	0	23	77
PM	22	0	9	91
RA	55	0	31	69
3	81	0	17	83
PM	24	0	13	88
RA	49	0	18	81
2	79	0	20	80
PM	16	0	19	81
RA	56	0	23	77
1	35	0	29	71
PM	15	0	27	73
RA	18	0	22	78

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 64.--Engineer's Rating of the Importance to Him of Working in a Cooperative, Friendly Atmosphere

Occup. Level	Number	1*	2	3
6M Total	38	0	34	66
Prefer More	9	0	33	67
Right Amount	22	0	36	64
5M	114	1	32	68
PM	25	0	52	48
RA	70	1	23	76
4M	233	0	36	64
PM	47	2	55	43
RA	138	0	33	67
5S	50	2	36	62
PM	16	0	31	69
RA	29	3	34	62
4S	84	0	32	68
PM	22	0	32	68
RA	55	0	31	69
3	81	0	23	77
PM	24	0	29	71
RA	49	0	22	78
2	79	0	29	71
PM	16	0	38	63
RA	56	0	27	73
1	35	0	17	83
PM	15	0	20	80
RA	18	0	11	89

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 65.--Engineer's Rating of the Importance to Him of Having Stability in His Life and Work

Occup. Level	Number	1*	2	3
6M Total	38	8	47	45
Prefer More	9	0	89	11
Right Amount	22	14	32	55
5M	114	5	58	37
PM	25	12	48	40
RA	70	4	57	39
4M	231	5	46	49
PM	47	9	60	32
RA	137	4	43	53
5S	50	8	46	46
PM	16	13	44	44
RA	29	7	48	45
4S	84	6	42	52
PM	22	0	41	59
RA	55	9	45	45
3	81	6	48	46
PM	24	4	75	21
RA	49	6	37	57
2	78	3	44	54
PM	16	13	44	44
RA	56	0	45	55
1	35	6	40	54
PM	15	7	27	67
RA	18	6	44	50

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 66.--Engineer's Rating of the Importance to Him of Having Adequate Retirement, Health Insurance, and Other Company Benefits

Occup. Level	Number	1	2	3
6M Total	38	8	42	50
Prefer More	9	0	33	67
Right Amount	22	14	45	41
5M	114	2	58	40
PM	25	0	60	40
RA	70	3	56	41
4M	232	1	46	53
PM	47	2	53	45
RA	138	1	46	54
5S	50	8	44	48
PM	16	6	63	31
RA	29	10	34	55
4S	84	4	49	48
PM	22	5	50	45
RA	55	4	47	49
3	81	2	49	48
PM	24	8	50	42
RA	49	0	53	47
2	79	4	51	46
PM	16	13	50	38
RA	56	0	50	50
1	35	3	51	46
PM	15	7	47	47
RA	18	0	50	50

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 67.--Engineer's Rating of the Importance to Him of Making All Decisions on Matters Directly Concerning His Technical Responsibility

Occup. Level	Number	1*	2	3
6M Total	38	8	58	34
Prefer More	9	11	67	22
Right Amount	22	5	55	41
5M	113	7	50	42
PM	25	4	28	68
RA	69	9	58	33
4M	232	4	60	36
PM	47	2	62	36
RA	138	6	62	32
5S	50	6	50	44
PM	16	6	56	38
RA	29	7	48	45
4S	84	6	58	36
PM	22	9	55	36
RA	55	5	60	35
3	81	5	51	44
PM	24	4	36	58
RA	49	4	59	38
2	79	6	59	34
PM	16	13	31	56
RA	56	4	66	30
1	35	6	63	31
PM	15	7	60	33
RA	18	6	67	28

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 68.--Engineer's Rating of the Importance to Him of Being Individually Responsible for Technical Projects (Rather than Work with a Group)

Occup. Level	Number	1*	2	3
6M Total	38	45	32	24
Prefer More	9	44	33	22
Right Amount	22	41	36	23
5M	112	27	51	22
PM	25	20	44	36
RA	68	31	51	18
4M	232	24	57	19
PM	47	26	49	26
RA	137	26	60	14
5S	49	8	67	24
PM	16	13	69	19
RA	28	7	61	32
4S	84	15	67	18
PM	22	9	64	27
RA	55	18	69	13
3	81	11	60	28
PM	24	13	58	29
RA	49	10	59	31
2	79	9	65	27
PM	16	6	56	38
RA	56	9	68	23
1	35	9	69	23
PM	15	20	40	40
RA	18	0	94	6

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 69.--Engineer's Rating of the Importance to Him of Advancing to a High Level Staff Technical Position

Occup. Level	Number	1*	2	3
6M Total	38	26	53	21
Prefer More	9	22	33	44
Right Amount	22	32	55	14
5M	114	18	55	26
PM	25	8	60	32
RA	70	20	51	29
4M	229	15	52	33
PM	46	17	39	43
RA	137	15	56	29
5S	49	2	37	61
PM	16	0	50	50
RA	28	4	29	68
4S	84	2	45	52
PM	22	0	27	73
RA	55	4	53	44
3	81	1	43	56
PM	24	4	46	50
RA	49	0	41	59
2	79	5	46	49
PM	16	6	38	56
RA	56	5	48	46
1	35	6	31	63
PM	15	0	33	67
RA	18	6	33	61

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

APPENDIX E

Tables 70-86

TABLE 70.--Engineer's Rating of the Importance to Him of Additional Education to Prepare Himself for Increased Technical Responsibilities

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	13	50	38
Right Amount	20	0	70	30
5M				
PM	24	13	50	38
RA	66	5	55	41
4M				
PM	47	2	43	55
RA	132	5	43	52
5S				
PM	13	8	46	46
RA	27	0	19	81
4S				
PM	22	0	32	68
RA	53	2	43	55
3				
PM	24	0	25	75
RA	49	0	35	65
2				
PM	16	0	25	75
RA	55	0	38	62
1				
PM	15	0	20	80
RA	18	0	17	83

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 71.--Engineer's Rating of the Importance to Him of Additional Education to Remedy Deficiencies in His Initial Training

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	38	38	25
Right Amount	20	15	65	20
5M				
PM	24	13	63	25
RA	64	13	64	23
4M				
PM	46	15	46	39
RA	133	9	59	32
5S				
PM	14	29	36	36
RA	27	15	48	37
4S				
PM	22	9	41	50
RA	53	13	51	36
3				
PM	23	13	48	39
RA	49	10	57	33
2				
PM	16	19	31	50
RA	55	5	56	38
1				
PM	15	33	20	47
RA	18	22	50	28

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 72.-- Engineer's Rating of the Importance to Him of Additional Education to Help Him Prepare for a Position in Management

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	0	25	75
Right Amount	20	25	50	25
5M				
PM	24	13	42	46
RA	64	19	42	39
4M				
PM	45	13	33	53
RA	127	5	47	48
5S				
PM	13	15	54	31
RA	26	31	58	12
4S				
PM	22	23	50	27
RA	53	26	47	26
3				
PM	23	13	43	43
RA	49	14	51	35
2				
PM	16	19	31	50
RA	55	9	51	40
1				
PM	15	27	27	47
RA	18	22	56	22

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 73.--Engineer's Rating of the Importance to Him of Additional Education to Obtain an Advanced Degree (or a Bachelor's Degree)

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	50	38	13
Right Amount	20	45	40	15
5M				
PM	24	25	63	13
RA	65	49	38	12
4M				
PM	47	38	43	19
RA	129	34	46	20
5S				
PM	13	54	46	0
RA	27	41	59	0
4S				
PM	20	15	40	45
RA	53	47	38	15
3				
PM	23	30	48	22
RA	49	31	41	29
2				
PM	16	19	38	44
RA	54	17	54	30
1				
PM	15	0	7	93
RA	18	6	44	50

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 74.--Engineer's Rating of the Importance to Him of Additional Education to Perform His Present Assignment Better

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	38	13	50
Right Amount	20	15	50	35
5M				
PM	24	8	42	50
RA	66	9	45	45
4M				
PM	46	9	35	57
RA	133	6	44	50
5S				
PM	14	14	43	43
RA	27	0	48	52
4S				
PM	22	23	41	36
RA	53	9	34	57
3				
PM	23	13	43	43
RA	49	14	43	43
2				
PM	16	19	31	50
RA	55	5	58	36
1				
PM	15	27	20	53
RA	18	22	28	50

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 75.--Engineer's Rating of the Importance to Him of Additional Education to Keep From Becoming Obsolete

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	13	38	50
Right Amount	20	5	55	40
5M				
PM	25	0	20	80
RA	66	8	32	61
4M				
PM	47	2	36	62
RA	132	3	36	61
5S				
PM	14	0	21	79
RA	27	0	22	79
4S				
PM	22	9	18	73
RA	53	6	26	68
3				
PM	23	4	22	74
RA	49	0	35	65
2				
PM	16	0	19	81
RA	55	4	36	60
1				
PM	15	7	27	67
RA	18	0	22	78

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 76.--Engineer's Rating of the Importance to Him of Additional Education Because His Manager Expects Him to Take Additional Coursework

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	75	25	0
Right Amount	20	65	30	5
5M				
PM	24	71	25	4
RA	64	61	38	2
4M				
PM	47	68	28	4
RA	129	50	46	5
5S				
PM	13	62	38	0
RA	27	67	30	4
4S				
PM	22	64	32	5
RA	53	55	42	4
3				
PM	23	61	35	4
RA	49	65	35	0
2				
PM	16	88	13	0
RA	55	44	55	2
1				
PM	15	67	33	0
RA	18	44	50	6

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 77.--Engineer's Rating of the Importance to Him of Additional Education to Enable Him to Become an Authority in His Field of Specialty

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	50	38	13
Right Amount	20	25	55	20
5M				
PM	23	39	52	9
RA	54	23	52	25
4M				
PM	47	13	68	19
RA	130	18	59	22
5S				
PM	13	31	54	15
RA	27	7	67	26
4S				
PM	22	18	45	36
RA	52	17	56	27
3				
PM	23	22	43	35
RA	49	20	51	29
2				
PM	16	25	31	44
RA	55	15	51	35
1				
PM	15	13	27	60
RA	18	17	39	44

*Percentages of those who feel this factor to be of:

1. Little importance
2. Fair importance
3. Great importance

TABLE 78.--Engineer's Rating of the Degree to Which Coursework About the Company and its Organization Meets His Aims

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	38	63	0
Right Amount	20	40	50	10
5M				
PM	24	21	58	21
RA	65	31	51	18
4M				
PM	47	21	53	26
RA	130	18	58	24
5S				
PM	13	15	77	7
RA	26	42	50	8
4S				
PM	22	23	68	9
RA	52	46	52	2
3				
PM	23	39	35	26
RA	49	33	57	10
2				
PM	16	31	56	13
RA	55	22	69	9
1				
PM	15	47	33	20
RA	18	50	39	11

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

TABLE 79.--Engineer's Rating of the Degree to Which Coursework Dealing with His Field (Electrical Engr., Mechanical Engr., Etc.) Meets His Aims

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	13	75	13
Right Amount	19	11	68	21
5M				
PM	24	8	46	46
RA	64	11	50	39
4M				
PM	47	6	53	40
RA	131	7	56	37
5S				
PM	14	0	43	57
RA	26	0	31	69
4S				
PM	22	0	55	45
RA	53	4	43	53
3				
PM	24	0	42	58
RA	49	2	35	63
2				
PM	16	0	19	81
RA	55	0	38	62
1				
PM	15	0	13	87
RA	18	0	6	94

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

TABLE 80.--Engineer's Rating of the Degree to Which Coursework Dealing with General Science Outside His Field Meets His Aims

Occup. Level	Number	1	2	3
6M				
Prefer More	8	25	75	0
Right Amount	20	20	75	5
5M				
PM	24	21	46	33
RA	64	27	59	14
4M				
PM	47	19	72	9
RA	128	26	66	8
5S				
PM	13	0	69	31
RA	26	0	62	38
4S				
PM	22	18	64	18
RA	52	12	73	15
3				
PM	23	13	65	22
RA	49	18	61	20
2				
PM	16	31	31	38
RA	55	9	73	18
1				
PM	15	13	67	20
RA	18	6	79	17

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

TABLE 81.--Engineer's Rating of the Degree to Which Coursework Directed Specifically at His Specialty (Feedback Control, Magnetics, Etc.) Meets His Aims

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	25	25	50
Right Amount	19	16	63	21
5M				
PM	24	17	58	25
RA	64	22	48	30
4M				
PM	47	17	64	19
RA	128	19	50	31
5S				
PM	14	7	57	36
RA	25	0	60	40
4S				
PM	22	9	41	50
RA	53	8	43	49
3				
PM	24	21	42	38
RA	49	2	49	49
2				
PM	16	13	44	44
RA	55	9	55	36
1				
PM	15	7	60	33
RA	18	6	28	67

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

TABLE 82.--Engineer's Rating of the Degree to Which Coursework Dealing with General Topics in the Social Sciences (Psychology, Sociology, Etc.) Meets His Aims

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	25	50	25
Right Amount	20	35	60	5
5M				
PM	24	8	75	17
RA	65	34	52	14
4M				
PM	47	19	66	15
RA	131	24	63	13
5S				
PM	13	38	46	15
RA	26	38	58	4
4S				
PM	22	23	68	9
RA	53	30	70	0
3				
PM	23	39	52	9
RA	49	37	57	6
2				
PM	16	50	31	19
RA	55	20	73	7
1				
PM	14	50	43	7
RA	18	44	56	0

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

TABLE 83.--Engineer's Rating of the Degree to Which Coursework Directed at Improving His Knowledge of Economics and Business Matters Meets His Aims

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	0	63	38
Right Amount	20	15	50	35
5M				
PM	24	0	67	33
RA	64	9	50	41
4M				
PM	47	2	57	40
RA	132	9	61	30
5S				
PM	14	21	43	36
RA	26	31	58	12
4S				
PM	22	18	59	23
RA	53	17	75	8
3				
PM	23	26	43	30
RA	48	21	63	15
2				
PM	16	31	38	31
RA	55	11	71	18
1				
PM	15	47	27	27
RA	18	28	50	22

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

TABLE 84.--Engineer's Rating of the Degree to Which Coursework Directed at Broadening His Appreciation of Art and Literature Meets His Aims

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	38	63	0
Right Amount	20	35	50	15
5M				
PM	24	29	63	8
RA	64	53	45	2
4M				
PM	47	40	53	6
RA	131	38	57	5
5S				
PM	13	54	46	0
RA	26	62	38	0
4S				
PM	22	41	45	14
RA	53	42	58	0
3				
PM	23	43	52	4
RA	49	47	49	4
2				
PM	16	50	50	0
RA	55	38	55	7
1				
PM	14	43	57	0
RA	18	61	28	11

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

TABLE 85.--Engineer's Rating of the Degree to Which Coursework Concerning Management Skills and Dealing with Others Meets His Aims

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	0	38	63
Right Amount	20	10	35	55
5M				
PM	25	0	32	68
RA	65	3	42	55
4M				
PM	47	0	28	72
RA	132	3	27	70
5S				
PM	13	8	46	46
RA	26	31	54	15
4S				
PM	22	14	45	41
RA	53	11	57	32
3				
PM	23	4	30	65
RA	49	8	65	27
2				
PM	16	13	44	44
RA	55	5	56	38
1				
PM	15	33	33	33
RA	18	39	39	22

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

TABLE 86.--Engineer's Rating of the Degree to Which Coursework About Other Company Products and Systems Meets His Aims

Occup. Level	Number	1*	2	3
6M				
Prefer More	8	0	100	0
Right Amount	20	15	65	20
5M				
PM	25	4	64	32
RA	66	9	64	27
4M				
PM	47	2	60	38
RA	133	4	60	36
5S				
PM	13	15	54	31
RA	26	23	62	15
4S				
PM	22	18	68	14
RA	53	13	72	15
3				
PM	23	9	78	13
RA	49	16	69	14
2				
PM	16	13	69	19
RA	55	9	69	22
1				
PM	15	20	60	20
RA	18	33	50	17

*Percentages of those who feel this factor meets aims:

1. Poorly
2. Fairly
3. Greatly

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