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THE OCCUPATIONAL INTERESTS
OF RESEARCH AND DEVELOPMENT
MANAGERS AND TECHNICAL SPECIALISTS

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Zaleznik, Dalton and Barnes (1970) raised an issue several years ago pertinent to the management of technical careers which is probably more pressing today than it was then. Their study explored the career problems of a group of scientists and engineers in the research and development division of a larger organization. They note in the introduction that:

In today's knowledge-oriented organizations, it is commonplace for the trained specialist - whether engineer, scientist, operations researcher, lawyer, teacher, or physician - to confront the choice of continuing a career as a specialist or shifting into a managerial career. For some, the choice is clear-cut. For others the choice may be difficult and, once made, a source of continuing ambivalence.

For the latter individuals, career conflict was seen as exacting personal as well as organizational costs and dysfunctions. The general hypothesis and findings spoke to the question of congruence between the career roles (technical or managerial), and the ego interests of the individual (as measured by the Allport-Vernon-Lindzey Study of Values). The organization under study had recently instituted a dual ladder career system through which individuals could allocate themselves to either a managerial or technical track. This decision was compared to the salience of theoretical versus economic values in the ego structure of the individuals, and a four-way typology was developed as shown in Table 1. This typology reflects two paths to congruence between ego interests (latent values) and occupational roles - the oriented specialist and the oriented manager; it also illustrates two patterns of incongruence, conflicted specialists and managers. Using this typology as a starting point, the study by Zaleznik, Dalton and Barnes presented an interesting array of evidence suggesting that oriented persons utilized their capabilities more fully, gained more gratification and fulfillment from their work, and exhibited higher levels of personal development through occupational experience. In short, person-role correspondence suggests the individual is operating more on the basis of synthesis, and "...energy tends to be invested

TABLE 1. TYPOLOGY OF CAREER PREFERENCE
AND VALUE SALIENCE¹

SALIENCE OF VALUES

| | | THEORETIC | ECONOMIC |
|------------------------------|------------|-------------------------|------------------------|
| | | TECHNICAL SPECIALIST | ORIENTED SPECIALIST |
| <u>CAREER PREFERENCE</u> | MANAGERIAL | CONFLICTED MANAGER | ORIENTED MANAGER |

¹ Adapted from Zaleznik, et. al., 1970.

more in outer objects according to an underlying conception of self and less on inner conflicts provoked by felt uncertainties or inadequacies" (Zaleznik, Dalton and Barnes, 1970, p. 37).

The present research is animated by the general hypothesis that positive outcomes obtain where individuals allocate themselves into occupational roles consonant with their psychological functioning. It is exploratory at this point in that our purpose is to describe the occupational interest patterns on a cross sectional sample of scientists and engineers from two research and development organizations. It incorporates the technical/managerial choice in that roughly 40% of the respondents reported themselves in a managerial career track and 60% reported themselves as following a technical career path. We have also examined occupational interest patterns by career stage, and will provide some initial data utilizing the Dalton, Thompson and Price (1977) career stage model.

The Strong Campbell Interest Inventory (SCII) was used to measure occupational interests. The general occupational themes based on John Hollands (1973) personality model served to organize our analyses, and have a general similarity to the AVL used by Zaleznik, Dalton and Barnes. The six themes of Realistic, Investigative, Artistic, Social, Enterprising and Conventional have some analogous properties to the AVL variables of Economic, Theoretical, Aesthetic, Social, Political and Religious. Economic values probably correspond most closely to the Conventional and Enterprising themes of the SCII, and Theoretical values correspond most closely to the Investigative theme.

In addition, there have been some studies of R&D personnel utilizing the Strong Vocational Interest Blank (SVIB) which was a close precursor of the present SCII, but did not incorporate scales for Holland's general occupational themes. Campbell and Holland (1972), in a major innovation merged Holland's personality theory with the SVIB (which had largely been atheoretical until that time) by scaling the six

general occupational themes for men. Hansen and Johansson (1972) did the analogous psychometric work for women.

A major longitudinal research effort by Rosen, Billings and Turney (1976) covering the period 1971-1976 found R&D managers to be higher than technical personnel on a composite managerial interest scale constructed by summing the SVIB occupational scales of production manager, army officer, and air force officer. Technical personnel scored higher than R&D managers on a technical/scientific interest measure constructed by summing the SVIB occupational scales for mathematician, chemist, engineer, physicist and architect. Mossholder, Dewhirst and Arvey (1981) studied SVIB profiles of researchers and developers, but did not analyze managers. Their results indicated development personnel were somewhat more managerially oriented than research personnel in the sense that they tended to score higher on managerially based occupational scales than research personnel.

The present research compared technical personnel with R&D managers on the six general occupational themes and twenty-three basic interest scales from the SCII. The six general occupational themes are listed and defined in Table 2. In addition, the six areas are broken into finer components (the twenty-three basic interest scales) as shown in Table 3. Both the general occupational themes and basic interest scales have a mean of 50 and standard deviation of 10 relative to the norm group upon which they were constructed. Holland's six occupational themes are arranged in a hexagonal structure shown in Figure 1. A basic tenet of this model is the idea that neighbors are reinforcing domains, whereas themes across any of the three possible diagonals represent somewhat opposing states. The investigative individual enjoys spending long periods of time thinking about the same problem, is somewhat introverted, does not particularly enjoy exercising social power, etc. The enterprising individual enjoys persuasion and social power, likes action rather than reflection, is extroverted, and enjoys running from one activity to the other without

TABLE 2. HOLLAND'S GENERAL OCCUPATIONAL
THEME DEFINITIONS

REALISTIC -- RUGGED, ROBUST, PRACTICAL, PREFER TO DEAL WITH
THINGS RATHER THAN PEOPLE, MECHANICAL INTERESTS

INVESTIGATIVE -- SCIENTIFIC, TASK ORIENTED, PREFER ABSTRACT
PROBLEMS, PREFER TO THINK THROUGH PROBLEMS RATHER THAN
ACT ON THEM, NOT HIGHLY PERSON ORIENTED, ENJOY AMBIGUITY

ARTISTIC -- ENJOY CREATIVE SELF EXPRESSION. DISLIKE HIGHLY
STRUCTURED SITUATIONS, SENSITIVE, EMOTIONAL, INDEPENDENT,
ORIGINAL

SOCIAL -- CONCERNED WITH WELFARE OF OTHERS, ENJOY DEVELOPING,
TEACHING OTHERS, GOOD IN GROUP SETTINGS, EXTROVERTED,
CHEERFUL, POPULAR

ENTERPRISING -- GOOD FACILITY WITH WORDS, ESPECIALLY SELLING,
LEADING -- ARE ENERGETIC, EXTROVERTED, ADVENTUROUS, ENJOY
PERSUASION

CONVENTIONAL -- PREFER ORDERED, NUMERICAL, VERBAL WORK, ENJOY
LARGE ORGANIZATIONS, RESPOND TO AUTHORITY, DISLIKE AMBIGUOUS
SITUATIONS, STABLE, DEPENDABLE

TABLE 3. BASIC INTEREST SCALES ASSOCIATED WITH
HOLLAND'S SIX OCCUPATIONAL THEMES

| <u>GENERAL OCCUPATIONAL THEMES</u> | <u>BASIC INTEREST SCALES</u> |
|--|---|
| REALISTIC | AGRICULTURE, NATURE, ADVENTURE MECHANICAL ACTIVITIES, MILITARY ACTIVITIES |
| INVESTIGATIVE | SCIENCE, MATHEMATICS, MEDICAL SCIENCE, MEDICAL SERVICE |
| ARTISTIC | MUSIC/DRAMATICS, ART, WRITING |
| SOCIAL | TEACHING, SOCIAL SERVICE, ATHLETICS, DOMESTIC ARTS, RELIGIOUS ACTIVITIES |
| ENTERPRISING | PUBLIC SPEAKING, LAW/POLITICS, MERCHANDISING, SALES, BUSINESS MANAGEMENT |
| CONVENTIONAL | OFFICE PRACTICES |

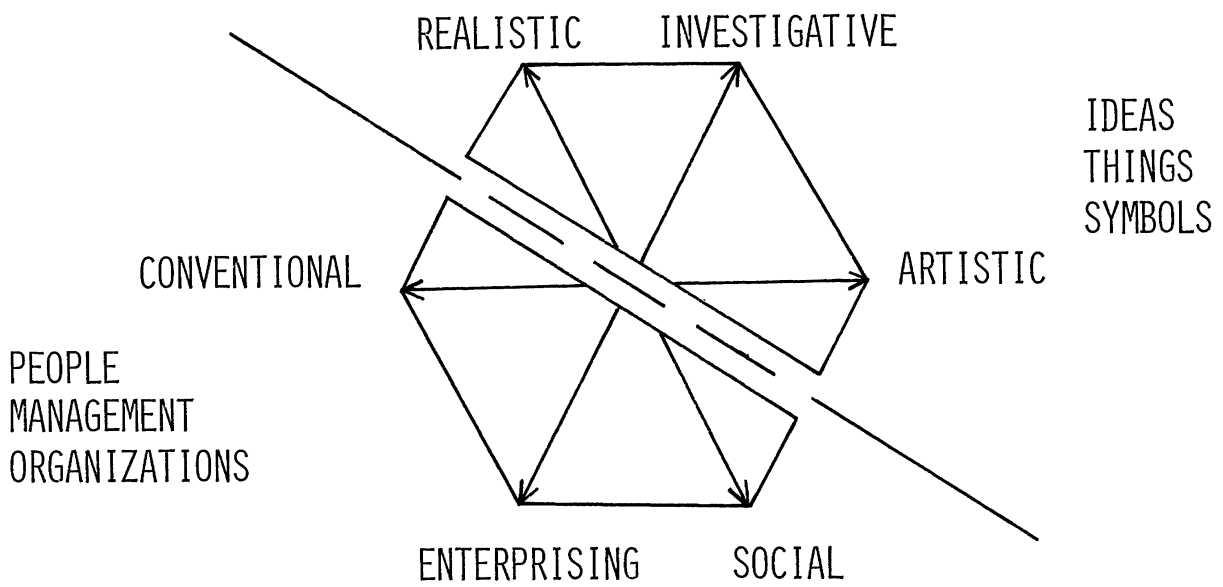


FIGURE 1. HOLLAND'S HEXAGONAL MODEL OF OCCUPATIONAL INTERESTS AND DOMAINS

getting deeply involved in details. The hexagonal model could be bifurcated as shown by the dotted line in Figure 1. Persons in the upper right half of the hexagon could generally be viewed as endorsing the world of things, ideas and symbols. Persons whose interests fall in the lower left half could generally be viewed as endorsing the world of people, management and organizations.

A general organizing hypothesis in the present study is that R&D managers will exhibit a general pattern of interests which is simultaneously investigative and enterprising, or investigative and conventional. In other words, it is this joint occurrence of opposing domains which will characterize the R&D manager, who must simultaneously have one foot in the world of science and engineering and another foot in the world of management. In Holland's theory, domains which skip one neighbor are of intermediate similarity (or dissimilarity). Thus, it may be less of a strain for the R&D manager to be simultaneously invested in the investigative and conventional domains. This would be the manager who pays attention to budgets, deadlines, organized research results, etc. The investigative-enterprising manager incorporates a difficult polarity, but would be interested in selling his or her ideas, and would enjoy persuading others (top management?) to back research and development projects with money and other resources.

In addition to assessing whether respondents were on a technical or managerial career position, an attempt was also made to assess career stage through a self report questionnaire. The career stage framework was developed by Dalton, Thompson and Price (1977) and posits that professional careers can be characterized by a series of role demands which require coping with different work activities, psychological challenges, and emotional issues as one moves through the stages. The model is illustrated in Table 4, and the stages are labeled Apprentice, (I), Independent Contributor (II), Mentor (III) and Sponsor (IV). Given the demands of the different stages, it was hypothesized that R&D personnel in stages III and IV (Mentor and Sponsor) would exhibit higher scores in the Conventional, Enterprising

TABLE 4. THE FOUR STAGE MODEL OF PROFESSIONAL CAREERS
(DALTON, THOMPSON AND PRICE, 1977)

| | STAGE I | STAGE II | STAGE III | STAGE IV |
|----------------------------|---------------------------------------|-------------------------|------------------------------------|---|
| CENTRAL ACTIVITY | HELPING LEARNING FOLLOWING DIRECTIONS | INDEPENDENT CONTRIBUTOR | TRAINING INTERFACING | SHAPING THE DIRECTION OF THE ORGANIZATION |
| PRIMARY RELATIONSHIP | APPRENTICE | COLLEAGUES | MENTOR | SPONSOR |
| MAJOR PSYCHOLOGICAL ISSUES | DEPENDENCE | INDEPENDENCE | ASSUMING RESPONSIBILITY FOR OTHERS | EXERCISING POWER |

and Social themes of the SCII since those motives are more adapted to the demands of those career stages.

The stages may be described as follows: Stage one is the apprentice stage. Here the young professional must learn which tasks are most critical and which require the most attention. Much of the work in stage one is routine, detailed work, yet these persons must also show a willingness to take on new challenging tasks. In terms of relationships during this stage, the individual must adjust to being a subordinate. Thus, the major psychological issue during this stage is adjusting to the dependence inherent in this subordinate role.

Stage two is called the independent contributor stage. The primary task of the individual in this phase is to establish a reputation as a technically competent professional. Although there are risks of becoming pigeon-holed in one area, or, of their area being phased out, most successful professionals must at this stage establish a base as a technically competent professional in some specialized area. The major concern in terms of relationships and psychological issues in this phase is the independence versus the dependence of the first phase. At this phase the professional must be able to come up with his own ideas to new situations.

Stage three has been called the mentor stage. During this stage the professional begins to assume the responsibility for influencing, directing, and guiding other people. The stage three professional plays a major role in developing individuals in stage one. Activities in this area may involve the informal mentoring of others because of skills developed in stage two, being an "idea man" for others or assuming a formal managerial role. A major shift in relationships takes place here because for the first time the professional assumes responsibility for others. Psychologically, this is a time of developing confidence in oneself as well as helping to do so for junior professionals. Some find this stage to be very rewarding and remain in it until retirement.

Persons in stage four are those who provide direction for the overall organization. These people may exercise their influence in any number of ways:

... negotiating and interfacing with key parts of the environment; developing new ideas, products, markets, or services that lead the organization into new areas of activity; or directing the resources of the organization toward specific goals. (Dalton, Thompson and Price, 1977)

Stage four professionals may be upper level managers, internal entrepreneurs or idea innovators. They may be responsible for selecting the developing persons who will be groomed for future key positions. One of the major, if not the major, psychological concern for these stage four professionals is becoming accustomed to the use of power.

The Sample and Initial Results

The sample was drawn from a high energy physics firm, and the research and development division of a large telecommunications and electronics firm. Table 5 shows the age and educational levels of the technical and managerial groups. Respondents were asked to indicate whether their work was technically or managerially oriented, and if managerially based, at what level of management they would classify themselves (on a five step hierarchy). In addition, respondents were shown four role descriptions of the career stages, and asked to rate on a ten point scale how well each role described their work - in other words, they were asked to rate the four career stages in terms of how applicable each was for them. Operationally, the individual was categorized in the stage which was rated as most descriptive of their work.

Table 6 shows the means on the six general occupational themes for the managerial and technical groups. The top three themes generically represent the endorsement of things, ideas and symbols. The bottom three themes represent a generic endorsement of organizations, management and people. Pairwise t statistics were shown for each variable; however, this is generally not the best method for

TABLE 5. AGE AND EDUCATIONAL BACKGROUND OF SAMPLE

| | AGE (YEARS) | |
|-----------|-------------------|------------------|
| | <u>MANAGERIAL</u> | <u>TECHNICAL</u> |
| MEAN | 42.5 | 33.7 |
| STD. DEV. | 7.1 | 7.9 |
| N | 50 | 66 |

| | EDUCATIONAL LEVEL | |
|------|-------------------|------------------|
| | <u>MANAGERIAL</u> | <u>TECHNICAL</u> |
| PH'D | 21% | 24% |
| MS | 60% | 29% |
| BS | 19% | 47% |

| EDUCATIONAL AREA - TOTAL SAMPLE | |
|---|----------|
| | <u>%</u> |
| PHYSICS | 31% |
| ELECTRICAL/ELECTRONIC ENGINEERING . . . | 28% |
| COMPUTER SCIENCE & ENGINEERING. | 17% |
| MISCELLANEOUS (MATHEMATICS, CHEMISTRY, MATERIALS SCIENCE, OTHER ENGINEER.) | 24% |

TABLE 6. MEANS AND STANDARD DEVIATIONS ON GENERAL OCCUPATIONAL THEMES FOR MANAGERS AND TECHNICAL PERSONNEL

| | | | R&D MANAGERS, N=50 | TECHNICAL PERSONNEL, N=66 | PAIRWISE T | SIGNIFI. |
|--|---------------|-----------|--------------------------|---------------------------------|---------------|----------|
| IDEAS THINGS & SYMBOLS | REALISTIC | \bar{X} | 56.9 | 56.7 | .10 | .91 |
| | | S | 8.7 | 8.9 | | |
| | INVESTIGATIVE | \bar{X} | 58.9 | 56.9 | 1.65 | .10 |
| | | S | 5.7 | 7.2 | | |
| | ARTISTIC | \bar{X} | 47.3 | 47.1 | .10 | .92 |
| | | S | 9.0 | 10.6 | | |
| ----- | | | | | | |
| PEOPLE, MANAGEMENT & ORGANIZATIONS | SOCIAL | \bar{X} | 44.7 | 42.4 | 1.27 | .20 |
| | | S | 9.3 | 9.8 | | |
| | ENTERPRISING | \bar{X} | 48.4 | 44.7 | 2.29 | .01 |
| | | S | 8.7 | 8.3 | | |
| | CONVENTIONAL | \bar{X} | 52.0 | 47.6 | 2.81 | .006 |
| | | S | 8.6 | 8.3 | | |

* HOTELLING T² STATISTIC ON SOCIAL, ENTERPRISING AND CONVENTIONAL MEANS = 8.45, F = 2.77, P < .04,

assessing the degree of difference unless the individual ^cto ratios are adjusted for intercorrelations among the variables, and for the fact that when large numbers of t tests are performed some will be significant by ^cchange alone. A more appropriate test is to simultaneously consider whether one set of means significantly departs from another set. A general working hypothesis was that the managers and technical personnel would depart from each other on the social, enterprising and conventional themes since these represent an interest and temperament pattern most consonant with and adapted to managerial work. The bottom half of Table 6 shows a Hotelling T^2 statistic for comparing two vectors of means, and is significant of the .04 level. Figure 2 shows the relations from Table 6 graphically plotted in Holland's hexagonal framework. It can be seen here that the managerial profile swells away from the technical profile in the social, enterprising and conventional domains. This pattern suggests that R&D managers retain their identity as scientists and engineers, but "embroidery" their scientific orientation with a managerial orientation relative to the technical personnel.

Table 7 shows means on the basic interest scales, and pairwise t ratios. Standard deviations are not shown, but generally fall between 8 and 10. Again, the pairwise t ratios have not been adjusted, and are not as important as the pattern of differences. The largest differences occur around athletics, public speaking, merchandising and business management. The most consistent differences occur within the enterprising area. However, it is interesting to note that the athletic interest scale also shows a large difference (with managers being more interested in athletics). This pattern is meaningful and important in an exploratory study since it is consistent with life history studies of scientists and engineers. For instance, Chaney and Owens (1964) found that engineers with a managerial and sales orientation reported more participation in athletics as youngsters than did engineers who remained technically oriented in later life.

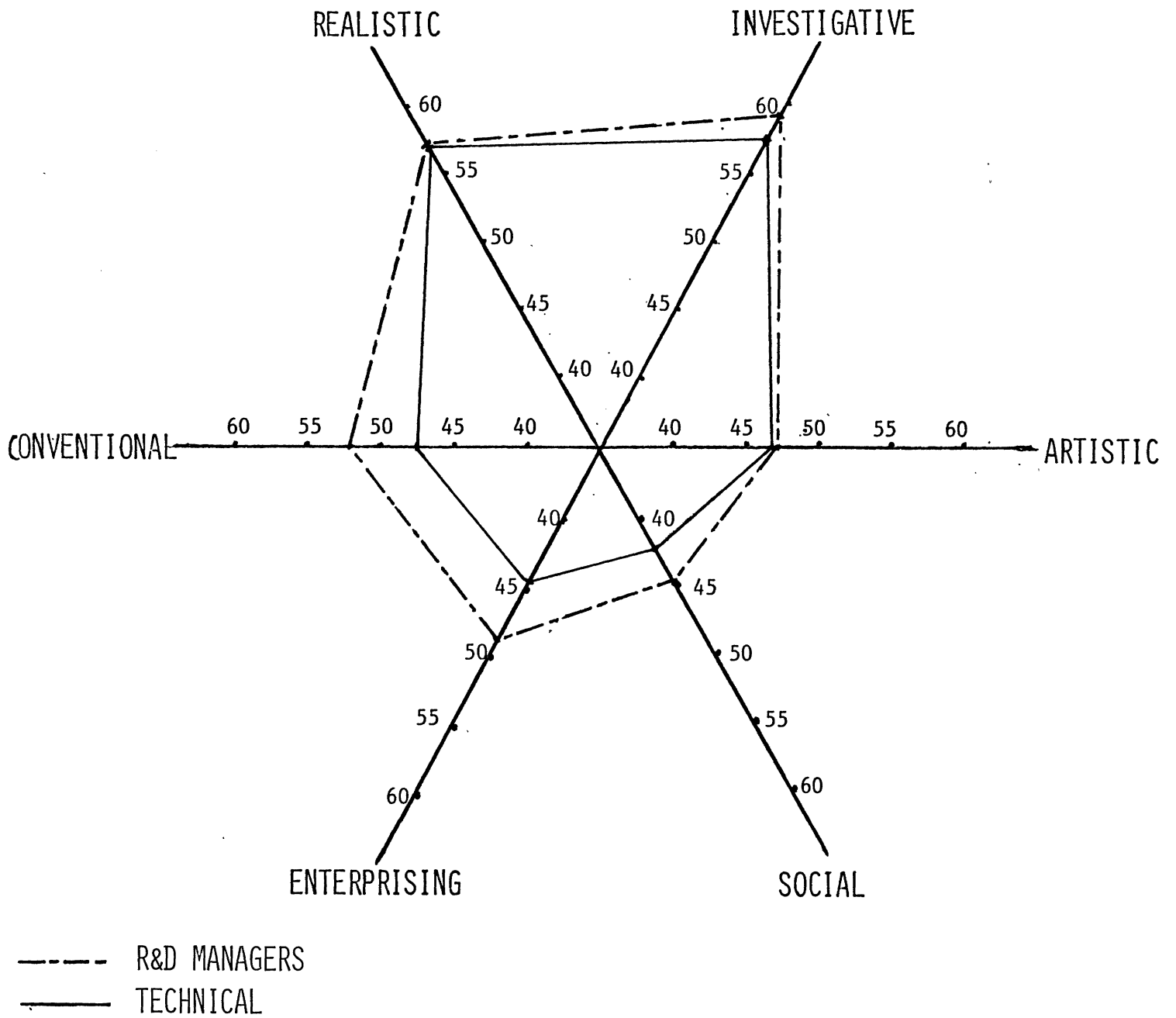


FIGURE 2. GENERAL OCCUPATIONAL THEME PATTERNS FOR R&D MANAGERS AND TECHNICAL PERSONNEL.

TABLE 7. MEANS ON BASIC INTEREST SCALES FOR
MANAGERIAL AND TECHNICAL PERSONNEL

| | BASIC INTEREST SCALES | R&D MANAGERS (N=50) | TECHNICAL PERSONNEL (N=66) | T | SIGN |
|------------|--------------------------|------------------------|-------------------------------|------|------|
| R THEME | AGRICULTURE | 50.2 | 50.3 | -.08 | |
| | NATURE | 51.7 | 50.1 | .84 | |
| | ADVENTURE | 55.2 | 52.8 | 1.45 | |
| | MILITARY ACTIVITIES | 50.8 | 49.4 | .79 | |
| | MECHANICAL ACTIVITIES | 58.5 | 59.8 | -.86 | |
| I THEME | SCIENCE | 59.9 | 60.3 | -.38 | |
| | MATHEMATICS | 59.9 | 59.3 | .59 | |
| | MEDICAL SCIENCE | 54.6 | 51.6 | 1.74 | * |
| | MEDICAL SERVICE | 48.2 | 48.4 | -.14 | |
| A THEME | MUSIC/DRAMATICS | 46.5 | 47.7 | -.64 | |
| | ART | 46.6 | 46.9 | -.17 | |
| | WRITING | 45.7 | 44.9 | .47 | |
| S THEME | TEACHING | 48.4 | 46.5 | 1.22 | |
| | SOCIAL SERVICE | 42.1 | 40.0 | 1.32 | |
| | ATHLETICS | 51.9 | 47.0 | 2.63 | ** |
| | DOMESTIC ARTS | 44.3 | 44.0 | .17 | |
| | RELIGIOUS ACTIVITIES | 44.2 | 44.3 | -.04 | |
| E THEME | PUBLIC SPEAKING | 49.0 | 45.4 | 2.25 | ** |
| | LAW/POLITICS | 48.8 | 45.8 | 1.79 | * |
| | MERCHANDISING | 46.3 | 42.8 | 2.25 | ** |
| | SALES | 47.2 | 44.6 | 1.89 | * |
| | BUSINESS MANAGEMENT | 51.0 | 45.1 | 3.53 | ** |
| C THEME | OFFICE PRACTICES | 45.8 | 43.9 | 1.31 | |

* P < .10

** P < .05

Participation in athletics seemed to be associated with a more gregarious, socially confident life pattern. Klimoski (1973) also found research oriented engineers to be lower on a physical activity/athletic factor and social confidence factor, but higher on introversion than engineering managers. A similar pattern has been established for physical scientists with technical versus managerial aspirations (Albright and Glennon, 1961).

Tables 8 and 9 show analogous results for career stage. Career Stages I and II were combined for a comparison with stages III and IV since the transition into managerial work usually (but not always) coincides with a transition from stage II to stage III. Career stage data was not available for all respondents, but a significant portion provided the necessary data. The pattern of occupational interests are relatively similar to the managerial versus technical categories, but not as pronounced. The enterprising scale stands out as the most significant discriminator, and fits intuitively with the exercise of power in stage IV. It was somewhat surprising that the social theme means in Table 8 were reversed relative to what we expected. Stage III, the Mentor stage implies connecting emotionally with younger employers and providing a teaching and developing function. Even the basic interest scale of teaching is in the reverse direction. Athletic interest, in fact, is the only social scale in the expected direction. Of course, we do not know if mentoring was actually occurring. Daniel Levinson et. al. (1978) is of the opinion that true mentoring in contemporary organizations is a rare phenomenon in spite of much popular rhetoric about the topic. As our sample size increases, we will also be partitioning the data into managerial and non-managerial stage III and IV individuals for comparison of interest patterns.

In conclusion, this paper provides initial data that the study of occupational interest patterns for R&D managers and technical track personnel is potentially fruitful. As the need for more efficient human resource utilization among technical

TABLE 8. MEANS AND STANDARD DEVIATIONS ON GENERAL OCCUPATIONAL THEMES FOR CAREER STAGE I & II VERSUS CAREER STAGE III & IV

| | | | CAREER STAGE I & II N=55 | CAREER STAGE III & IV N=47 | PAIRWISE T | SIGNIF. |
|--|---------------|-----------|--------------------------------|----------------------------------|---------------|---------|
| IDEAS, THINGS & SYMBOLS | REALISTIC | \bar{X} | 56.1 | 57.1 | .60 | .55 |
| | | S | 9.3 | 7.5 | | |
| | INVESTIGATIVE | \bar{X} | 57.1 | 57.7 | .43 | .67 |
| | | S | 7.0 | 6.8 | | |
| | ARTISTIC | \bar{X} | 46.3 | 47.7 | .66 | .51 |
| | | S | 10.9 | 9.9 | | |
| ----- | | | | | | |
| PEOPLE, MANAGEMENT & ORGANIZATIONS | SOCIAL | \bar{X} | 42.8 | 42.0 | -.41 | .68 |
| | | S | 10.2 | 8.7 | | |
| | ENTERPRISING | \bar{X} | 44.3 | 47.2 | 1.78 | .08 |
| | | S | 8.7 | 7.9 | | |
| | CONVENTIONAL | \bar{X} | 48.0 | 49.3 | .80 | .42 |
| | | S | 8.9 | 7.4 | | |

*HOTELLING T^2 STATISTIC ON SOCIAL, ENTERPRISING AND CONVENTIONAL MEANS = 5.58, F = 1.83, P<.15.

TABLE 9. MEANS ON BASIC INTEREST SCALES
FOR CAREER STAGES I AND II VERSUS
III AND IV

| | BASIC INTEREST SCALES | STAGES I & II (N=55) | STAGES III & IV (N=46) | T | SIGN |
|------------|--------------------------|-------------------------|---------------------------|-------|------|
| R THEME | AGRICULTURE | 49.9 | 49.6 | -.17 | |
| | NATURE | 49.7 | 49.4 | -.17 | |
| | ADVENTURE | 52.2 | 55.2 | 1.69 | * |
| | MILITARY ACTIVITIES | 49.0 | 50.2 | .65 | |
| | MECHANICAL ACTIVITIES | 59.8 | 59.3 | -.29 | |
| I THEME | SCIENCE | 60.4 | 59.4 | -.85 | |
| | MATHEMATICS | 59.6 | 59.3 | -.34 | |
| | MEDICAL SCIENCE | 51.9 | 51.3 | -.34 | |
| | MEDICAL SERVICE | 48.5 | 46.4 | -1.39 | |
| A THEME | MUSIC/DRAMATICS | 46.8 | 47.9 | .61 | |
| | ART | 46.3 | 47.1 | .36 | |
| | WRITING | 44.6 | 45.3 | .37 | |
| S THEME | TEACHING | 47.8 | 45.7 | -1.34 | |
| | SOCIAL SERVICE | 40.1 | 40.4 | .15 | |
| | ATHLETICS | 47.1 | 49.1 | 1.01 | |
| | DOMESTIC ARTS | 44.2 | 43.0 | -.64 | |
| | RELIGIOUS ACTIVITIES | 43.9 | 43.6 | -.15 | |
| E THEME | PUBLIC SPEAKING | 44.9 | 48.8 | 2.26 | ** |
| | LAW/POLITICS | 45.9 | 48.6 | 1.49 | |
| | MERCHANDISING | 42.3 | 45.0 | 1.62 | * |
| | SALES | 44.3 | 46.4 | 1.55 | |
| | BUSINESS MANAGEMENT | 44.9 | 48.9 | 2.26 | ** |
| C THEME | OFFICE PRACTICES | 44.4 | 43.5 | -.59 | |

* P < .10

** P < .05

personnel increases, studies which pertain to the counseling, recruitment and allocation of scientists and engineers into the appropriate career path will become increasingly important.

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