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## Analysis of Management and Professional Jobs for Systematic Career Planning and Development

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ANALYSIS OF MANAGEMENT AND PROFESSIONAL JOBS FOR SYSTEMATIC  
CAREER PLANNING AND DEVELOPMENT

by

PATRICK CALBY

A Dissertation Submitted to the Faculty of the Graduate School  
of Loyola University of Chicago in Partial Fulfillment  
of the Requirements for the Degree of  
Doctor of Philosophy

April

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## VITA

The author, Patrick Calby, is son of Edward M. Calby and Margaret D. Calby. He was born on March 11, 1955, in Montrose, Pennsylvania.

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## INTRODUCTION

In recent years, numerous developments have created a need for more rational and systematic approaches to the identification and development of managerial and professional talent. Krzystofiak, Newman, and Anderson (1979) pointed out that in making decisions about internal human resource flow, personnel specialists recognize the importance of moving people through a series of jobs which capitalize in part on their prior job experiences. They wrote: "However, given the subjective nature of most job analysis systems and the large number of jobs, the mobility patterns are almost certainly non-optimal" (p. 343). Rusmore (1973) even suggested that executive promotion is often a matter of luck. These concerns exemplify the need to learn a great deal more about the circumstances and determiners of employee progression into management and professional positions.

Perhaps the biggest single influence on employee selection, promotion, and training practices in this era has been Title VII of the 1964 Civil Rights Act, which prohibits discrimination in employment based on race, color, religion, national origin, or sex (Miner & Miner, 1979; Muchinsky, 1982). According to Thornton and Byham (1982) the results of recent court cases are clear. If a selection procedure works to the disadvantage of any subgroup of people then the organiza-

tion must show that it followed the Uniform Guidelines on Employee Selection Procedures (1978) in the development, validation, and use of its decision making procedures. "The organization must be able to provide evidence that substantiates the validity and fairness of the procedures being used. Such evidence must demonstrate the use of professionally sound practices including adequate job analysis, criterion measures, samples of subjects, statistical analyses, and conditions for gathering research data" (Thornton & Byham, 1982, p. 372). Thus, organizations must be able to demonstrate the job relatedness (validity) of their personnel practices in order to pass the close scrutiny of Federal enforcement agencies. The job analysis is critical to the total validation process.

Hiring, training, and promotion procedures can have a strong influence on employees' work motivation and satisfaction. A study by Galby (1981) showed that promotion opportunities were the single best predictor of overall employee job satisfaction. This effect may be especially true for what Yankelovich (1979) called today's "new breed workers." According to Yankelovich, workers of the eighties are younger, better educated, more affluent, and have a different set of values than workers of the past. They feel that a good job that provides stimulation, challenge, and opportunities is something that they are entitled to. Upper level management and professional jobs provide numerous rewards such as increased pay and benefits, autonomy of action, and broad personal responsibility, that could satisfy some of the expectations of new breed workers. However, for these rewards to

have positive effects on motivation and performance, employees must see that these rewards are administered fairly and equitably on the basis of effort and good performance (Landy & Trumbo, 1980, chapter 9; Porter & Lawler, 1968). That is, the best performers should get the best opportunities for promotions. Thus, the development of fair and equitable practices for selection and promotion of personnel to upper level jobs can be a key to maintaining a motivated and satisfied workforce.

Finally, upper level management and professional jobs in this country are increasing in number and are becoming more and more specialized and complex (Mitchell, 1978). A review by McCormick (1979) showed that since 1950, the number of jobs in service producing industries (such as government, finance, insurance, health, real estate, education, wholesale and retail trade, transportation, and public utilities) has nearly doubled, while employment in the goods producing industries (such as agriculture, mining and petroleum, contract construction, and manufacturing) has remained relatively constant. Thus, the service producing industries have accounted for virtually all the additional jobs that have developed over the last several decades, and the trend is expected to continue. This rapid growth and expansion in the service producing industries created the need for a new kind of management. These changes in the nature of jobs in today's technological and complex society clearly indicate that organizations need desperately to learn more about the nature of upper level management and professional jobs in order to train, develop, and prepare a reservoir of qualified personnel for key management positions. This need is

especially acute for rapidly growing and expanding organizations that need qualified people to take over and manage new parts of the organization.

How can organizations satisfy these diverse, interrelated needs for a) more rational career planning and promotion systems, b) legally defensible selection procedures, c) promotion opportunities that motivate employee performance, and d) career planning and training programs that prepare employees for the complexities of changing management jobs? A prerequisite for satisfying these diverse needs is a comprehensive job analysis to identify what managers and professionals do on their jobs and what they need to know in order to perform them successfully.

### Objectives

The overall objective of this study was to develop a taxonomy of management and professional jobs. More specifically, three major objectives were: a) to identify and measure the important characteristics and requirements of a wide variety of management and professional jobs; b) to identify differences in management and professional jobs in different organizational functions and hierarchical levels in terms of those characteristics and requirements; and c) to suggest some ways in which the results could be used as the basis for an integrated system of personnel practices based on accurate job information. These were essentially the same objectives of taxonomic research in general which usually include: a) the identification and measurement of the

characteristics or phenomena in question; b) the determination of the interrelationships between and among the individual classes in terms of such characteristics, and c) the discovery of whatever order, system, or structure may be inherent in the area of investigation McCormick (1979). Each of the major objectives of the study are discussed in more detail below.

### Measurement of Job Characteristics

McCormick (1979) explained that two general types of information are usually elicited by job analysis techniques: a) information about work activities or tasks, and b) information about personnel or attribute requirements of jobs. Details about these two general types of job information as related to this study are discussed below.

Information about work activities or tasks can take different forms but in general it provides a description of what a person does on a job, for example, write reports, persuade others, or approve requests. Two types of job activities have been identified in management job analysis research. One type describes the general processes involved in the work (e.g., planning, decision making, controlling, supervising, interacting with associates, etc.). The other type describes technically oriented task content that is related to a specific occupation (e.g., financial affairs, computer programming, sales and marketing, etc.). This distinction is not often made in the management job analysis literature, but it is very useful for understanding the nature of management job activities. Both types of activities were examined in this study.

Information about personnel or attribute requirements of jobs describes what a person must know or be able to do in order to perform the job successfully. This information is often referred to as knowledge, skill, and ability (KSA) requirements or personal characteristics required for job performance. Such KSAs fall into two major classes (McCormick, 1979). One of these classes includes abilities and traits that most people possess in varying degrees, such as cognitive or intellectual abilities and personality traits. The other class of skills and knowledge tends to be job related, that is, they are based on specialized education, training, or experience, and tend to be related to a specific occupation, e.g., accounting. The two classes of personnel requirements parallel the process and technical activities of management jobs. A great deal of research has been done on personal traits or characteristics associated with management jobs, but very little research has been done on the technical knowledge requirements of management jobs. The view has been that technical knowledge areas are too job specific and are not generalizable across situations. The view in this study was that both types of personnel requirements need to be examined in order to fully understand the nature and requirements of management jobs.

Two separate lists of items were generated to measure the personnel requirements of management and professional jobs in this study. One list included general personal abilities and characteristics that might be required for various management and professional jobs (e.g., ability to maintain high standards of performance, and to show enthusi-

asm). The other list included more specialized areas of technical knowledge related to management and professional jobs (e.g., financial management, and industrial engineering).

In summary, three types of job information were examined in this study in order to obtain a comprehensive description of the characteristics and requirements of management and professional jobs: a) job activities, including both process and technical activities, b) technical knowledge requirements, and c) individual ability requirements. Previous research suggests that it is best to keep these types information separate in analyzing jobs (Guion, 1979; Ramos, 1979). The objective was to use factor analysis to identify the underlying clusters, and to develop reliable and valid measures for each type of job information.

### Differences in Organizational Levels and Functions

Not all management and professional jobs are the same, and it is important to identify the differences in order to link personnel practices to specific job requirements, rather than to consider all jobs as requiring the same general knowledge, skills, and abilities. The most important lines along which management and professional jobs vary are organizational functions and hierarchical levels. Obviously, top level executives perform different tasks and require different skills than managers and professionals in lower levels. The goal of this study was to identify specifically the characteristics that most clearly distinguish among management and professional jobs at different organiza-



tional levels. It was also expected that large differences could be identified among management and professional jobs in different organizational functions (e.g., personnel, sales, and manufacturing). For example, managers and professionals in a sales and marketing function would clearly perform different tasks and require different skills than professionals or managers in a computer operations function. The goal of this study was to identify specifically the characteristics on which management and professional jobs in different functional areas vary.

### Applications to Personnel Practices

The final objective was to show how the results of the previous steps could be used to develop fair and legally defensible systems for career planning and development. Career planning and development actually involve a number of specific personnel practices, including selection, training, promotions, transfers, performance appraisal, and others. For these practices to be fair and legally defensible they must be linked to specific job requirements. The results of the job analysis study can be used to develop an integrated system of personnel practices based on accurate job information. The objective of this study was to suggest some ways that the results could be used for this purpose.

A review of the literature on management and professional job analysis as related to the goals and objectives of this study is presented in the next chapter.

## REVIEW OF MANAGEMENT JOB ANALYSIS RESEARCH

Campbell, Dunnette, Lawler, and Weick (1970) pointed out that "it is difficult to describe any job and discover what it calls for in employee behaviors, but unusually so for managerial jobs because they change so much from ... time to time, person to person, and situation to situation" (p. 71). This complexity, however, has not prevented researchers from extensively studying management jobs. The multitude of studies probably reflects to some extent the utility of job analysis information in fulfilling the personnel functions of selection, placement, promotion, and training of management and professional personnel. The goal of many of these studies has been to discover the fundamental dimensions along which management jobs differ and to develop ways of measuring them. Ideally, it would be desirable to be able to describe any management or professional job in terms of a relatively small number of measures, just as people can be described in terms of height, weight, age, sex, intelligence, and so forth (Campbell et al., 1970).

Several good reviews of the management and professional job analysis literature have already been done. Campbell et al. (1970) reviewed several studies within the broader framework of identifying the determinants of managerial effectiveness. Prien and Ronan (1971) highlighted some of the shortcomings and problems with analysis of man-

agement jobs within a more general attempt to fix in time the state of the art in job definition and measurement. In his dissertation, Mitchell (1978) presented a chronological overview of the study of higher level jobs from 2200 B.C. through 1976 with particular emphasis on approaches that were used to determine wage and salary rates for these jobs. Bass (1981, chapter 17) reviewed research on leadership and management in the working situation, most of which dealt with description of management and professional job activities. Finally, Thornton and Byham (1982) reviewed management job analysis studies that were particularly relevant to assessment center methodology. The review that follows is to some extent a review of these reviews.

It was not possible to review every study on management job analysis. Instead an attempt was made to review those studies that were applicable to a wide variety of management and professional jobs, that appeared to be particularly well done, represented landmark studies, or identified unique characteristics not mentioned in other studies. Prien and Ronan (1971) noted that a number of studies have been done on higher level specialist positions, such as salesman, school administrator, training director, and the like. While each of these studies is of interest in its own right, the results are of limited generalizability. This type of study was avoided in the following review. The review is divided into three parts corresponding to major objectives of this study: a) management job activities, b) management traits or personal attributes required for successful performance, and c) differences in job activities and requirements across management functions and levels.

## Management Job Activities

### Intuitively Derived Executive Functions

Barnard (1939) (cited in Mitchell, 1978) derived three essential functions of executive positions based on a rational analysis of the requirements of such positions. The three functions were:

1. To formulate and define the purpose of the organization,
2. To promote securing of effort essential to accomplish the purpose,
3. To provide a system of communication necessary for the accomplishment of this purpose.

These general functions were similar to those posited by traditional commentators such as Taylor, Urwick, Fayol, and Davis who maintained that the primary functions of leadership were planning, organizing, coordinating, and controlling (Bass, 1981; Mintzberg, 1971). Managers do no doubt perform these functions, but for most purposes a more searching and detailed description of what managers and professionals do was needed.

### Critical Incidents of Air Force Executives

Flanagan (1951) used the "critical incident technique" to collect written examples of effective and ineffective performance of a large sample of Air Force officer-executives. These incidents were then grouped into rationally derived categories of behaviors considered to be essential requirements of the positions. He identified six broad categories of administrative behavior:

1. Handling administrative detail: Understanding instructions, scheduling work, getting information from records, getting ideas from others, checking accuracy of work, and writing letters and reports.
2. Supervising personnel: Matching personnel and jobs, delegating authority, giving orders and instructions, supporting authorized actions, encouraging ideas, developing teamwork, setting a good example, assisting subordinates in their work, evaluating subordinates' work, and maintaining relations with subordinates.
3. Planning and directing action: Taking responsibility, solving problems, making use of experience, long-range planning, taking prompt action, suspending judgement, making correct decisions, making forceful efforts, and absorbing materials.
4. Acceptance of organizational responsibility: Complying with orders and directives, accepting organizational procedure, subordinating personal interests, cooperating with associates, showing loyalty, and taking responsibility.
5. Acceptance of personal responsibility: Attending to duty, attending to details, reporting for appointments, meeting commitments, being fair and scrupulous, maintaining military appearance, adapting to associates, adapting to the job, and conforming to civil standards.
6. Proficiency in military specialty: Possessing fundamental training, improving effectiveness, keeping well informed in specialty, applying training and information, showing ingenuity in specialty, and handling related assignments.

Although these behaviors were derived from high level military personnel they appear to be relevant to a wide variety of management and professional jobs. The results place emphasis on process activities, particularly "accepting responsibility," and they only allude to more technical aspects of the job in terms of the need for proficiency in military specialty. These categories of behaviors seem to deal with a combination of job activities and personal characteristics required for effective job performance.

### Critical Incidents of Executives in Private Organizations

In another, less well known study, Williams (1956) (cited in Campbell et al., 1970) also used the critical incident technique to collect over 3,500 incidents from 742 executives in a variety of companies and geographic locations. The incidents were grouped by content into 80 critical requirements of executives' jobs in the following six general areas:

1. Planning, organization, and execution of policy: Formulates effective plans and policies to achieve company objectives; communicates plans and policies to others; anticipates and overcomes difficulties in achieving objectives; delegates authority readily; utilizes experience; makes prompt and explicit decisions.
2. Relations with associates: Deals with peers, subordinates, and superiors effectively; supports policies, actions, and decisions and persuades others to do the same; prevents animosity or differences of opinion from interfering with work; demonstrates concern for wel-

fare of subordinates; supports policies and actions of superiors under all conditions; keeps well informed and keeps others informed; stimulates pride and motivation in others.

3. Technical competence: Displays up-to-date knowledge of management principles or specialty; effectively organizes and applies knowledge; provides information that is technically accurate; demonstrates ingenuity in solving management problems; seeks means of improving proficiency in management.
4. Coordination and integration of activities: Provides physical facilities required for effective performance; maintains facilities in good order; assumes responsibility for plans and actions to achieve objectives; applies own and others experience in policy making and planning; persists in efforts to reach objectives.
5. Work habits: Works diligently on delegated and self-assigned activities; works long hours when necessary; is punctual; plans and conducts meetings so as not to waste time; delegates and instructs others to cover own absences; is honest in all company matters; demonstrates pride and responsibility in work; makes reasonable estimates of time required to achieve objectives.
6. Adjustment to the job: Demonstrates that achievement of objectives is more important than personnel convenience; supports policies and personnel from unfair criticism or action; participates in community activities; assumes responsibilities of associates when necessary; fulfills commitments promptly; improves proficiency by reading, discussion, research, and study; is honest in statements about work or

actions; maintains good attitude despite strong emotional stress; makes good impression by temperate social conduct; is neat in appearance; performs effectively despite unusual demands; increases effectiveness by friendly, cooperative relations with others.

These behavioral categories reflect the processes involved in carrying out management and professional work, but they describe very little about the specific technical content of the job tasks. The emphasis in these categories is on relations with associates, good work attitudes, meeting objectives promptly, and performing competently. These are clearly important aspects of management and professional job performance, but more needed to be said about what managers and professionals actually do on their jobs.

Several behaviors dealing with meeting objectives and supporting policies appeared in more than one category. (Note that not all the behaviors in each category are listed above.) This exemplifies the difficulty of sorting a large number of critical incidents into a small number of rationally derived categories. Most later have used factor analysis to solve this problem of sorting tasks into categories.

### Ohio State Leadership Studies

Fleishman (1953) and his associates in the Ohio State Leadership studies used the 150 item Leadership Behavior Description Questionnaire to obtain descriptions of supervisors' behavior from their subordinates. Factor analysis of the intercorrelations of responses resulted in two major factors:



1. Consideration: Supervisor puts subordinates' suggestions into operation, makes subordinates feel at ease, is friendly and can be approached. These behaviors are contrasted to acting without consulting subordinates, and treating people without considering their feelings.
2. Initiating structure: Supervisor sees that subordinates are working up to limits, insists that foremen follow standard procedures, and offers new approaches to problems. These behaviors are contrasted to letting others work the way they think best, and waiting for subordinates to push new ideas.

Campbell et al. (1970) pointed out that these two factors must be an oversimplification of the full range of managerial job activities. They refer mostly to interactions between supervisors and their subordinates and do not cover numerous other activities besides supervision that are required in upper-level management and professional jobs. However, these factors are important to consider because they are frequently replicated (e.g., Prien, 1963), and the two-dimensional view of management remains predominant in much of the management literature.

### The Executive Position Description Questionnaire

Hemphill's (1959, 1960) research is viewed by many (e.g., Crooks, 1979) as a pioneering effort to describe the work of executives in a meaningful way. Hemphill developed the 575 item Executive Position Description Questionnaire (EPDQ) and administered it to 93 executives from five different companies. The items were classified as position

activities, position responsibilities, position demands and restrictions, and position characteristics. The respondents indicated the extent to which each item was part of their job on an eight-point scale. By a process of interbattery inverse factor analysis, jobs were clustered on the basis of profile similarity, and then the items with the highest ratings for each cluster were used to define the following ten factors of executive jobs:

1. Providing a staff service in nonoperational areas: Renders various staff services to superiors; gathers information; interviews and selects employees; briefs superiors; checks statements; verifies facts; and makes recommendations.
2. Supervision of work: Plans, organizes, and controls the work of others; has direct contact with workers and machines; is concerned with efficient use of equipment, the motivation of subordinates, efficiency of operations, and maintenance of a workforce.
3. Internal business control: Activities and concerns are in the areas of cost reduction, maintenance of proper inventories, preparation of budgets, justification of capital expenditures, determination of goals, definition of supervisory responsibilities, payment of salaries, and enforcement of regulations.
4. Technical aspects of products and markets: Activities and concerns in technical areas related to products, markets, and customers; develops new business, is aware of activities of competitors, and changes in demand for products or services; maintains contacts with customers; consolidates and analyzes data; assists sales people with important accounts.

5. Human, community, and social affairs: Indicates requirements to be effective in working with others; promotes goodwill of the company in the community; maintains the respect of important persons; speaks before the public; and sizes up people; nominates key people for promotion; appraises performance; and selects managers; participates in community affairs, clubs, and civic organizations.
6. Long-range planning: Systematic long-range thinking and planning; concerns are broad and oriented toward the future of the company; they extend to industrial relations, development of management, long-range objectives of the organization, solvency of the company, pilot projects, business activities the company should engage in, legislation that may affect the company, and evaluation of new ideas.
7. Exercise of broad power and authority: Exercises broad power and has final authority in a number of areas; visits major units of the company each year; makes recommendations on important matters; keeps informed about the company's performance; makes use of staff people, and interprets policy; is concerned with relationship with unions, capital expenditures, and long-range solvency of the company; has unusual freedom of personal action, and has very high status in this position.
8. Business reputation: Responsibility for the reputation of company products or services; concerns extend in either or both of two major directions - product quality and/or public relations; deals with product design, quality, product improvement, complaints con-

cerning products or services, delivery schedules, and the general goodwill of the company; makes stringent demands on personal behavior since deviations might reflect on the company's reputation; carries high status.

9. Personal demands: Stringent demands on personal behavior; unusually high concern with propriety of behavior, especially in interactions with superiors; senses obligation to act as a conservative business person; activities are at the highest staff levels and involve analysis of operations, setting objectives, and participating in high-level decisions.
10. Preservation of assets: Activities and concerns directly associated with the preservation of the physical assets of the company; concerns include capital expenditures, expenditures of large sums in routine operations, taxes, preservation of assets and the loss of company money; authorizes documents that obligate the company.

In reading the technical report on this research (Hemphill, 1959) it is striking, given the complexity of the data and analyses involved, that Hemphill managed to come up with a relatively small number of fairly concisely defined factors. One thing that helped was the reduction of the EPDQ to only 191 of the original 575 items. Regardless, Hemphill's work is perhaps one of the most comprehensive studies of higher-level positions, and the revised EPDQ remains the basis for a number of studies of management jobs today (e.g., Crooks, 1979).

In terms of job content, Hemphill introduced some technical specialty areas of importance on executives' jobs, for example, financial

matters and technical aspects of products and markets. These technical factors were only alluded to in terms of the need for technical competence in earlier studies (e.g., Flanagan, 1951).

Hemphill's factors do not seem to be totally independent, that is, they seem to overlap somewhat. For example, broad power, preservation of assets, and internal business control all seem closely related. They all involve final authority over financial matters and broad objectives of importance to the company. In that respect, long-range planning also seems to fit with these factors. Business reputation, technical aspects of products and markets, and human, community and social affairs all seem to be closely related. Hemphill combined many different types of items (i.e., activities, responsibilities, demands and restrictions), and used a very complex method of factor analysis to analyze the data. These characteristics along with a very small sample size and a large number of variables may have contributed to the fuzziness of the factors identified in the study. It may be possible to represent the fundamental functions and activities of management jobs in a smaller number of more clearly defined and independent factors.

### The Management Position Description Questionnaire

Tornow and Pinto (1976), noted several methodological problems with Hemphill's study, such as the use of Q-type factor analysis followed by R-type factor interpretation and the small sample size used in the study. They attempted to improve on some of these problems in the development of a behavior-based management job taxonomy. They used

Hemphill's original EPDQ, various management concepts, and interviews with executives and lower level managers, to generate over 1000 items representing management responsibilities, concerns, restrictions, demands, and activities. After pretesting the items, they developed the Management Position Description Questionnaire (MPDQ) which consisted of 208 of the original sample of items. A factor analysis of the MPDQ responses from 433 position incumbents, covering a wide range of managerial levels and functions, revealed the following 13 independent job factors:

1. Product marketing and financial strategy planning
2. Coordination of other units and personnel
3. Internal business control
4. Products and services responsibility
5. Public and customer relations
6. Advanced consulting
7. Autonomy of action
8. Approval of financial commitments
9. Staff service
11. Complexity and stress
10. Supervision
12. Advanced financial responsibility
13. Broad personnel responsibility

These factors show great similarity to Hemphill's, however, Tornow and Pinto claimed that their factors are more inclusive and behaviorally descriptive. Tornow and Pinto did identify at least two

factors not covered in Hemphill's EPDQ, advanced consulting and coordination of other units and personnel. However, Flanagan (1951) and Williams (1956) identified coordinating and consulting behavior categories in earlier studies.

The results of Tornow and Pinto's study seem to have some of the same problems as Hemphill's. Some of the factors seem to overlap, e.g., approval of financial commitments and advanced financial responsibility. Tornow and Pinto also used a number of different types of items, i.e., activities, concerns, responsibilities, demands or restrictions, and other characteristics. All these items were lumped together in the analyses, which makes it difficult to know whether the resulting factors reflect what managers actually do or just what they are concerned about. The sample size was much larger in Tornow and Pinto's study than in Hemphill's, but the ratio of subjects to variables (433 to 208) may not have been large enough to identify clear and reliable factors.

### The Position Description Questionnaire

In later studies designed to enhance and refine the MPDQ, Tornow (1979) and Gomez-Mejia, Page, and Tornow (1979) improved the sample of management jobs studied and improved the item coverage of the MPDQ to make it more representative of lower-level management positions and more applicable for job evaluation purposes. The result was the 235 item Position Description Questionnaire (PDQ) which measured the following nine position factors:

1. Strategic long-range planning: Engaging in planning, strategy development and decision making for major organizations. This includes determining the annual performance objectives, developing major plan revisions, revising the structure of one or more divisions, giving guidance in planning to other organizations, determining international business potential, and consulting on corporate wide problems.
2. Products/Services: Being involved in planning, scheduling, and monitoring the design, development, production, and delivery of products and services; tracking their progress, quality, and profitability.
3. Controlling: Having responsibility for controlling the allocation of human, financial, and material resources through activities such as assignment of supervisory responsibility, expense controls, performance goals, and budgets. Also included are employee relations responsibilities, establishing parameters to guide the planning of organizational units, developing operational policies and procedures under which managers are expected to perform, and allocating and scheduling resources to assure that they are available when needed.
4. Monitoring business indicators: Being concerned with monitoring key business indicators, such as total net income, five-year return on equity, total assets that have been acquired, net income as percent of sales, optimum return on investments of the organization, debt-equity ratio, market conditions and indicators.



5. Supervising: Planning, organizing, and controlling the work of subordinates. The activities are such that they require face-to-face contact with subordinates on an almost daily basis. The concerns covered by this factor revolve around getting work done efficiently through the effective utilization of employees. Activities include analyzing subordinates' strengths/weaknesses and training needs, reviewing their work methods for possible increases in productivity, providing them complete instructions when giving assignments, and scheduling their work so it flows evenly and steadily.
6. Coordinating: Coordinating the efforts of others over whom managers exercise no direct control. These activities include working in close association with individuals from other organizational groups, sharing information required by other organizational units, coordinating inter-dependent activities of different groups, handling conflicts or disagreements when necessary and touching base with many different people before making major decisions.
7. Customer relations/Marketing: Being involved in providing, promoting, and selling the company's products or services to external customers; negotiating with customers; identifying and developing new markets; monitoring sales volume and market conditions affecting customers; anticipating new or changed demands for products or services.
8. External contact: Interacting with individuals external to the company other than customers. These activities involve first-level contact and negotiation with employees of suppliers, representatives

of community organizations, and representatives of federal or state governments.

9. Consulting: Applying technical expertise to special problems, issues, questions, or policies; having an understanding of advanced principles, theories, and concepts in more than one required field; being asked to apply highly advanced techniques and methods to address issues and questions which very few other people in the company can do.

This set of factors is much clearer, more precise and parsimonious than any of its predecessors (Hemphill, 1959, 1960; Tornow & Pinto, 1976). The factors seem to reflect what managers actually do on their jobs rather than vague concerns or "other characteristics." Two new factors were identified, monitoring business indicators and external contact. Several of the same factors appeared again, planning, products and services, supervising, and controlling. These factors seem to emphasize technically oriented job tasks (e.g., financial matters, sales and markets, products and services) rather than interpersonal processes and personal demands.

### Analysis of Industrial Management Positions

Another study that Prien and Ronan (1971) considered to be exceptionally well done and seemed to be independent of Hemphill's and Tornow et al's. work was done by Baehr (1967). She used a questionnaire containing 122 generic job elements to obtain position descriptions from 600 industrial employees representing nine occupational groups in

levels from supervisors to top management. The factors that emerged from her analyses were (see Mitchell, 1978; or Prien & Ronan, 1971):

1. Setting organizational objectives
2. Improving work procedures
3. Promoting safety
4. Developing technical ideas
5. Judgement and decision making
6. Developing group cooperation and teamwork
7. Coping with difficulties and emergencies
8. Developing employee potential
9. Supervisory practices
10. Self-development and improvement
11. Promoting community and organizational relations
12. Handling outside contacts

Baehr identified several factors similar to ones that appeared in earlier studies, for example setting organizational objectives (planning), judgement and decision making (controlling), self-development, supervision, and community affairs. Several factors (2, 3, 6, 7, 8, and 9) all seemed to deal with specific parts of what might be a more general supervisory or relations with associates factor. Baehr included a number of interpersonal process factors (e.g., developing cooperation and teamwork) and personal factors (e.g., self-development) that were excluded from the latest studies by Tornow and his associates. Baehr's factors do not appear to include much technically oriented task content (e.g., financial planning, production, sales etc.).

Instead Baehr emphasized the processes involved in performing the job (e.g., developing ideas, judgement and decision making).

### Observational Analysis of Management Jobs

Mintzberg (1971; 1975) used in-depth observations and analyses of mail and verbal contacts of five chief executive officers to study the work of managers. Although this study was based on a small sample, it was very well done and represents a different technique for studying management jobs than has been discussed in any of the studies so far. Mintzberg derived six characteristics of managerial work from analyses of numerical data such as time spent with peers and duration of meetings. The six characteristics were:

1. The manager performs a great quantity of work at an unrelenting pace.
2. Managerial activity is characterized by variety, fragmentation, and brevity.
3. Managers prefer issues that are current, specific, and ad hoc.
4. Managers sit between their organizations and a network of contacts.
5. Managers demonstrate a strong preference for verbal media.
6. Despite the preponderance of obligations, managers appear able to control their own affairs.

According to Mintzberg, managers don't have much time for reflection, they are forced to treat issues quickly, they are accustomed to "instant communication" of current information, and they show a marked action orientation. Managers must be able to handle this high tension,

fast paced environment or else be swallowed up by it. Communication is the manager's work. These findings are consistent with the idea of satisficing proposed proposed by Herbert Simon in the 1950's. That is managers do not attempt to make optimal decisions and maximize efficiency, but instead they "satisfice" by taking into account available information when making decisions.

Mintzberg also analyzed the purpose of the executives' contacts and mail, and he chose ten roles to capture all of the activities observed in the study. Three interpersonal roles, figurehead, liaison, and leader, dealt essentially with interpersonal contacts. Three informational roles, nerve center, disseminator, and spokesperson, dealt with processing of information. The last four decisional roles, entrepreneur, disturbance handler, resource allocator, and negotiator, covered the decision making activities of the manager. According to Mintzberg, these ten roles form a gestalt which cannot be considered in isolation. The interpersonal roles derive directly from the status and authority of the position, which allow limitless contact with people within and outside the organization. The interpersonal roles provide access to the information used in the informational roles, which in turn give rise to the decisional roles, because the manager is the only person with enough information to understand all the implications of important decisions.

The major strength of Mintzberg's role analysis is the way he tied it altogether into a set of integrated activities. His analysis explains how all management job activities are interrelated. Factor

analytic studies seem to separate rather than integrate management activities. The roles in Mintzberg's study show some similarity to a number of the activity factors identified in factor analytic studies. For example, the leader role is synonymous to supervision factors; figurehead and liaison are similar to external contacts; and decisional roles correspond closely to planning and controlling activities. These roles describe the processes of managerial work, but they describe little about the actual content of the work (e.g., financial matters, production, etc.).

#### Summary of Management Job Activities

It is difficult to synthesize all of the above studies into one simple package. Management and professional jobs are clearly complex and involve a great diversity of activities and demands. A number of different methods have been used in studying the nature of management jobs. The methods include intuitive rational analysis, the critical incident technique, factor analysis, and observational studies. Factor analytic studies using questionnaires have the advantages of quantification, standardization, accuracy, and repeatability of results, but several of the factor analytic studies have been limited by small sample sizes for factoring a large number of variables. All the methods involve considerable judgement on the part of the researcher, and as Mintzberg (1971) pointed out, "every induction is a speculation and it guesses at a unity which the facts present but do not strictly imply" (p. B-102). In the critical incident technique, job behaviors are

dependent upon the recall of job incumbents, and then the job behaviors are grouped into rationally derived categories. In factor analytic studies researchers must first decide what characteristics to measure, and then they use further judgement in determining the appropriate number of factors to retain and in labelling the factors with appropriate names. In general, it seems that factor analysis should be the preferred method because of its empirical and psychometric properties. As McCormick (1979) pointed out, recent research efforts have centered around "quantifying job information, increasing its validity, eliminating subjectiveness, and reducing costs of its collection" p. 45). Factor analysis is the only method that can meet these needs. The critical problem in factor analysis is deciding what variables to measure in the first place.

One important distinction is between process, interpersonal, and personal characteristics of management and professional jobs (e.g., planning, decision making, relations with associates, acceptance of responsibility, and personal demands), and technically oriented task content (e.g., sales, financial matters, production, etc.). Flanagan (1951), Williams (1956), and Fleishman (1953) all emphasized the former and almost totally excluded the latter. Gomez-Mejia et. al. (1979) stressed the specific technically oriented task content (e.g., products, markets, business indicators), but they also included process variables (planning, coordinating, supervising). It seems that it is important to include both types of items in a job analysis in order to obtain a comprehensive description of management and professional job

activities. Personal demands (acceptance of responsibility, dealing with complexity and stress, work habits, loyalty, etc.) should be considered as personal abilities and should be assessed separately rather than mixed together with job activities.

No studies or methods came up consistently with the same characteristics of management and professional job activities. Relations with associates in one study was coordination and integration in another study, and supervision in still another study. This suggests that the description of management and professional job activities lacks construct validity. There is not widespread agreement on the core fundamental activities of management and professional jobs. Much more needs to be learned in order to identify and measure consistently a set of generally agreed upon management and professional job activities.

Some activities were identified consistently, albeit under different names, and were expected to come out in the present study. They include planning, decision making, controlling, supervision, relations with associates, activities involving products and markets, and community affairs.

In addition to knowing what managers and professionals must do on their jobs, it is also important to identify the personal characteristics and abilities that lead to effective job performance. A number of these characteristics are discussed in the next section.



## Personal Characteristics of Managers

Most of what is known about personal characteristics associated with effective management has been derived from studies of leadership traits. Leadership and management are generally considered to be similar enough so that the traits required for effective leadership are also considered to be required for effective management. However, Thornton and Byham (1982) noted that leadership may be the core of management, but management encompasses a far wider range of skills.

The most extensive review of traits and personal characteristics associated with leadership was compiled by Bass (1981) in Stogdill's Handbook of Leadership. Bass presented three major reviews: 1) a well known review by Stogdill (1948) of leadership trait studies conducted from 1904 to 1947; 2) a follow-up review on leadership trait studies from 1947 to 1970; and 3) a summary of factor analytic studies on leadership traits. The highlights of these reviews are summarized below.

### Leadership Trait Studies from 1904 to 1947

After reviewing hundreds of studies, Stogdill (1948) concluded that the factors associated with leadership could be classified into five general categories: capacity - which included intelligence, alertness, verbal facility, originality, and judgement; achievement - which included scholarship, knowledge, and athletic accomplishments; responsibility - which included dependability, initiative, persistence, aggressiveness, self-confidence, and desire to excel; participation - which included activity, sociability, cooperation, adaptability, and

humor; and status - which included socioeconomic position and popularity.

Stogdill also emphasized that the personal qualities, skills, and characteristics required in a leader are determined to a large extent by the situation in which the person has to function. In other words, possession of some combination of traits does not insure that a person will become a leader, but rather leadership status is acquired through active participation and demonstration that the leader can facilitate the accomplishment of group goals. Some of the characteristics associated with being able to organize and expedite such group efforts appear to be intelligence, alertness to the needs and motives of others, insight into situations, and habits such as responsibility, initiative, persistence, and self-confidence (Bass, 1981).

#### Leadership Trait Studies from 1947 to 1970

In a follow-up review, Bass (1981) summarized his findings in six general categories. In terms of physical characteristics, Bass found that leaders tended to be older, taller, heavier, and neater than average, but even more important they tended "to be endowed with an abundant reserve of energy, stamina, and ability to maintain a high rate of physical activity" (p. 77). Perhaps managers need a high level of energy and stamina in order to perform a great quantity of work at an unrelenting pace, as described by Mintzberg (1971).

Bass found that in terms of social background, high socioeconomic status (SES) provided an advantage in attaining leadership positions.

However, in more recent times people who attained high level positions came from lower SES groups and were better educated than a half century earlier. Moreover, Bass expected the rise in the general education level of the whole population and increased attention to affirmative action programs to accelerate the trend toward more emphasis on education and less emphasis on social status as a requirement for leadership status.

Bass found that in terms of intelligence and ability the most effective leaders were more, but not too much more, intelligent than those they led. Studies indicated uniformly that leaders were characterized by superior judgement, decisiveness, knowledge, and fluency of speech. However, studies indicated that large discrepancies between the capabilities of the leader and the led could make communications difficult as leaders could be preoccupied with ideas too far in advance of their followers.

Numerous personality traits were associated with effective leadership. Some of the characteristics were adaptability, strength of conviction, adjustment, aggressiveness, independence, resourcefulness, enthusiasm, tolerance of stress, alertness, originality, personal integrity, and self-confidence. A few traits such as ascendance, emotional balance, and extroversion were characteristic of some leaders but not others (Bass, 1981).

On task-oriented characteristics, Bass found uniformly positive results that indicated leaders were characterized by high needs for achievement and responsibility. They tended to show high degrees of

task orientation and were responsible and dependable in carrying out objectives. They exhibited enterprise and initiative and persistence in overcoming obstacles. Bass concluded that these characteristics all suggested that leaders were individuals with strong motivation, drive, and persistence.

Finally, in terms of social characteristics, Bass found that leaders were active participants in various activities and that they could interact easily with a wide range of personalities. They were attractive to followers because their interpersonal skills enabled them to foster cooperation, loyalty, and group cohesiveness.

#### Factor Analytic Studies of Leadership Traits

In summarizing the factor analytic studies of traits of leaders, Stogdill (in Bass, 1981) found that the most frequently occurring factors dealt with various skills of leaders. They included social, intellectual, technical, and administrative skills.

The second most frequent set of factors concerned how leaders related to their groups. The behaviors included maintaining group cohesiveness, coordination, task motivation, task performance, and a high quality of output. These task oriented behaviors were softened by nurturant behaviors and informal group controls which allowed groups to operate independently (Bass, 1981).

The last set of factors concerned numerous personality characteristics of leaders. They described leaders in terms of emotional balance, willingness to assume responsibility, ethical conduct, ability to communicate, dominance, energy, experience, courage, and maturity.

## Summary of Personal Characteristics of Managers

After reviewing the research on leadership traits it is easy to understand why many researchers have been disappointed with the trait approach to leadership. The research appears to suggest that leaders are "XXXXXer" than nonleaders, and just about any virtuous trait or characteristic can be substituted for the "XXX's." Moreover, more of all the traits is considered better (Landy & Trumbo, 1980). Such a conceptualization of leaders as high on all these traits probably leaves most aspiring young leaders feeling woefully inadequate.

The major problem, as Stogdill (1948) and more recent contingency theories of leadership have emphasized, is that pure trait approaches do not take account of the situation in which the person must function. The traits may have relevance in the situations in which they were studied, however, a comprehensive list of all the traits from all the studies may not have relevance to any one specific situation. Such a comprehensive list may have relevance only to the most demanding executive and professional jobs. The requirements in lower and middle level positions may be less demanding. Persons in lower level positions have time to develop and refine the personal characteristics required for more demanding upper level positions.

In summary, it seems nearly impossible to find many people who are high on all the traits that have been associated with effective leadership. It seems very important to consider specific traits required in different situations rather than to suggest that managers must be high on all traits. Nonetheless, some traits do seem to be

common to persons in leadership positions. Among those characteristics are above average intelligence and interpersonal skills, willingness to accept responsibility, and strong achievement motivation.

### Differences in Management Jobs by Levels and Functions

As pointed out in the previous section, it is important to specify the personal characteristics required in different situations rather than to consider all characteristics as required for all situations. Identification of the different characteristics and requirements of management and professional jobs in different organizational levels and functions would make it possible to link personnel practices to specific job requirements. Some research has been done to describe empirically some of these differences.

Guglielmino (1979) showed the differences in three types of skills, conceptual, human, and technical, needed at three levels of management. In entry level positions, technical skills were most important, followed by human skills, and only a small amount of conceptual skills. Mid-level positions required a fairly even mix of technical, human, and conceptual skills with a slight emphasis on human skills. The skill mix required for top level positions was exactly the reverse required for entry level positions. Conceptual skills were most important, followed by human skills, and only a small amount of technical skills. Conceptual skills included making decisions under uncertain conditions, identifying opportunities for innovation, and monitoring the business environment. Guglielmino noted that these

skills must be developed during an individual's career so that he or she possesses the necessary skills to function as a top level executive.

Pavett and Lau (1983) examined differences in Mintzberg's ten managerial roles and four types of management skills across hierarchical levels and functional specialties. They found that external roles of liaison, spokesperson, and figurehead were rated as more important at higher levels of management. The leader role was rated as more important for lower level managers than for either middle or top level managers. Sales managers emphasized interpersonal roles, staff specialists in accounting and finance emphasized informational roles, and R&D specialists rated the technical expert role as more important than did managers in other areas.

In terms of skill differences, Pavett and Lau found that conceptual skills were rated as more important at top levels than at lower levels, but no significant differences were found between levels for human, technical, or political skills. Human skills were rated as most important for successful job performance regardless of level. General managers rated human skills as more important than did R&D managers. Sales and marketing, accounting and finance, and general managers felt conceptual skills were more important than did production and engineering and personnel managers. R&D managers rated conceptual skills lower than all other managers which was contrary to the authors' expectations. The authors were also surprised to find that technical skills were more important to accounting and finance managers than to production and engineering managers.

The major implication of these differences, according to Pavett and Lau, is that managers are not as homogeneous a group as has been traditionally assumed. Rather, although managers may perform a common set of roles, effective managers behave differently in different situations.

Mahoney, Jerdee, and Carroll (1965) (cited in Bass, 1981) showed that supervising was the main function of 51 percent of low level managers, whereas it was the main function for only 36 percent of middle level managers, and 22 percent of upper level managers. Top level managers were more likely to view themselves as planners and generalists than were either low or middle level managers. This confirms a number of studies that suggest higher level managers spend more time in planning and organizing than in the technical work of the organization (Bass, 1981).

Hemphill (1959) (cited in Thornton & Byham, 1982) analyzed the percentage of jobs at three organizational levels that required a large amount of each of the ten job dimensions identified in his study. Hemphill's results confirm those from other studies that show the amount of supervision of work decreases from beginning, to middle, to upper management. Also, beginning management jobs show large amounts of staff service and involvement with technical aspects of products and markets. The human affairs and broad power dimensions increased markedly from lower to middle level management positions. Broad power and personal demands increased most significantly from middle to upper management positions. Business control, planning, human affairs, and per-



sonal demands were all important for the majority of upper management positions. Furthermore, all the dimensions except supervision of work and technical products and markets were important for more upper management positions than for either lower or middle positions.

Thornton and Byham (1982) reviewed the research on management jobs in different organizational levels and concluded that middle management is more different from first level management than it is from upper management. In other words the major shift in role and functions takes place when a supervisor is promoted to middle management, and relatively fewer changes take place with subsequent promotions.

Overall, the research on differences among management and professional jobs in different organizational levels and functions is quite sketchy. Campbell et al., (1970) stated "additional studies of this type are sorely needed" (p. 94). Nevertheless, a few differences have been consistently identified between different levels of management jobs. Top level jobs involve more planning and external contacts than lower level jobs, and incumbents must have good conceptual skills in order to make decisions under ambiguous conditions. Top level jobs involve less supervision of others and tend not to be directly involved in the technical work of the organization. Alternatively, lower level jobs involve more direct supervision and require more technical skills than upper level jobs. However, at least one study showed no differences in technical skills required across different hierarchical levels.

The important point is that differences in management and professional jobs do exist. These differences need to be identified so that selection, training, and career planning programs can be linked to specific job requirements rather than treating all management and professional jobs as a homogeneous group. It would be unfair and wasteful to select or train people on irrelevant or not useful skills.

### Summary of Management Job Analysis Research

A large amount of research has been done on the classification of management and professional job activities. It was concluded that both process activities and technically oriented job activities need to be examined. The results of previous studies are characterized by lack of clarity and only moderate consistency. The objective of this study was to develop clear, meaningful, and quantifiable descriptions of process and technically oriented management and professional job activities.

Very little research has been done on the technical knowledge requirements of management and professional jobs. Studies have only alluded to the need for technical competence or the need for technical skills at different levels of management jobs. A more detailed analysis is required to provide useful results for application to personnel practices. It was expected that a more detailed analysis of technical knowledge requirements would show large differences among jobs in different organizational functions. For example, a person in a personnel function would require knowledge of personnel management, compensation, and so forth, whereas a person in a manufacturing function would

require knowledge of good manufacturing procedures, engineering and so forth. Identification of these technical knowledge requirements could be very useful for showing how jobs change as one moves up the organizational hierarchy and for selection, training, promotion, and career planning program development.

A large amount of research has been done on the identification of individual abilities and personal characteristics associated with management and professional jobs. Some of the characteristics (e.g., acceptance of responsibility, and tolerance for stress) were actually derived from studies of management job activities and behaviors. Some other important abilities were drive, energy, stamina, and intellectual and interpersonal skills. It was expected that the results of the present study would be consistent with traits identified in prior studies.

Previous research on differences in management and professional job characteristics across organizational functions and hierarchical levels was sketchy. Much more of this type of research is needed to link personnel practices to specific job requirements.

## METHOD

### Data Description

The data for this study were collected from 882 management and professional employees at a large corporation involved in the manufacture and distribution of medical products with corporate offices in the Chicago area. A stratified random sample was obtained to represent all levels of management and professional personnel, from first level supervisors to the company president, and all functional areas of the organization (e.g., personnel, manufacturing, and sales). The return rate using a mail survey procedure was 97 percent.

The data were collected with the Management-Professional Job Analysis Inventory (MJI; Hill & Rucci, 1982). The MJI was divided into three major sections. The job activities section contained 222 task statements reflecting a wide assortment of work activities performed by employees in management and professional jobs. Four items were repeated twice for test-retest reliability estimates and were randomly distributed throughout this section of the inventory. The technical knowledge section contained 65 items that resembled majors or course offerings in a college curriculum. The individual abilities section contained 43 items representing various abilities or capabilities an incumbent might need in order to perform successfully on the job. One

individual ability item was deleted because of coding errors, and so only 42 items were in the data set. In general, all items were rated on a five-point scale of importance to the job (0=not at all important; 4=extremely important). The exact wording of the scale anchors was modified to fit the items rated in each section. The specific items for each category of the inventory were derived from a review of the management job analysis literature, other management job analysis inventories used in industry, and interviews with 50 randomly selected management and professional employees from the company. A copy of the complete MJI is included in Appendix A.

### Research Design

The basic research strategy was first to identify the underlying factor structure separately for the activities, knowledge, and abilities using exploratory factor analysis, and then to examine differences in factor scores across 14 organizational functions and four hierarchical levels using multivariate analysis of variance (MANOVA). The Statistical Analysis System software package (SAS, 1982) was used for the statistical analyses, because it could handle large numbers of variables. Although the study was not a true experiment, it was helpful to conceptualize the research design in terms of independent and dependent variables.

## Dependent Variables

The dependent variables were the task, knowledge, and ability characteristics from the MJI described above. The aim was to use exploratory factor analysis to reduce the original task, knowledge, and ability items in each section of the inventory into a smaller, more manageable number of reliable and valid factors. Previous research demonstrated that it was best to factor skill and task items separately and then to consider ways of combining them (Guion, 1979; Ramos, 1979). The details of the factor analysis procedures are described in the next section.

## Determining the Number of Factors

The most difficult problem in exploratory factor analysis is determining the "proper" number of factors to be extracted from the correlation matrix. The goal in factor analysis is to find the minimum number of factors that can be used to reproduce the correlations among the original variables under investigation (Gorsuch, 1974). Several different methods have been used to determine the correct number of factors. A common suggestion is to consider a combination of the methods to provide an estimate of the range within which the correct number of factors is likely to occur (Gorsuch, 1974; Kim & Mueller, 1982). The combination of methods considered in this study are summarized below.

Gorsuch (1974) proposed three categories of methods for determining the appropriate number of factors: a) statistical approaches, b)

mathematical approaches, and c) approaches for determining the non-trivial factors. The last category includes several specific methods which are actually variations on the same basic procedure.

Statistical approaches. The large sample chi-square test associated with the maximum likelihood factor analysis is the most satisfactory solution from a purely statistical point of view (Kim & Mueller, 1982). The basic approach is to subtract the reproduced correlation matrix from the original correlation matrix and test to see if the residual variance is statistically significant. If it is, then at least one more factor can be extracted. If there is no significant variance, then the correct number of factors has been extracted (Gorsuch, 1974). In exploratory factor analysis the approach is to keep extracting additional factors until adding one more produces a nonsignificant change in chi-square, and then the appropriate number of factors is one fewer (Bryant & Veroff, 1982; Gorsuch, 1974).

A number of criticisms have been made against the significance testing approach. Gorsuch (1974) pointed out that it is too dependent on sample size. If large samples of subjects are used, even trivial, uninterpretable factors turn out highly significant. Kim and Mueller (1982) also noted that with large sample sizes and many variables, the number of statistically significant factors tends to be much larger than the number of factors the researcher is willing to accept. Gorsuch suggested that for these reasons, psychometrically oriented factor analysts prefer to have large samples (e.g., five to ten times the number of variables but not less than several hundred) and then assume

that resulting factors are statistically significant. Kim and Mueller (1982) recommended that researchers apply the criterion of substantive significance after finding statistical significance. Substantive significance means that a factor accounts for a substantively large proportion of the variance.

Gorsuch (1974) emphasized that any factor extracted should certainly be statistically significant, and that significance tests are necessary when sample sizes are small. Moreover, statistical significance is more important than rules of thumb such as ten individuals for every variable. Significance tests establish the upper bound for the number of factors that could be extracted.

The chi-square statistic is used in two additional approaches to evaluate the relative degree of fit of factor models with different numbers of factors. These approaches require the researcher to use judgement in determining the overall fit of the model rather than relying on a statistical cutoff.

The key variable in one approach is the ratio of chi-square to the degrees of freedom (Bryant & Veroff, 1982). If a value of chi-square is obtained which is large compared to the number of degrees of freedom, this indicates more information can be extracted from the data and more factors are needed. If, on the other hand, a value of chi-square is obtained that is close to the number of degrees of freedom, it is possible that the model "fits too well," and less factors are needed to account for the data (Joreskog, 1969). A rule of thumb is that as this ratio approaches 2.00 the model fits quite well (F.



Bryant, personal communication, Nov. 3, 1983). but the goodness of the model cannot be decided on purely statistical grounds. Rather it depends on the usefulness of the results it produces (Joreskog,1969).

The Tucker-Lewis coefficient (TLC) reflects the improvement in variance accounted for by a k-factor model over a model that assumes there are no common factors (i.e., that the only source of variance is sampling error) (Alwin & Jackson, 1979; Bryant & Veroff, 1982). As can be seen in the formula below, the TLC is an extension of the ratio of chi-square to the degrees of freedom. As the fit of the factor model

$$\text{TLC} = \frac{(\chi_0^2/\text{df}_0) - (\chi_k^2/\text{df}_k)}{(\chi_0^2/\text{df}_0) - 1}$$

improves,  $\chi_k^2$  decreases and approaches  $\text{df}_k$ , and the TLC approaches 1.0. In general, the higher the TLC the better the model fits the data, but again the model can "fit too well." Perfect fit can be obtained by retaining as many factors as variables. Another rule of thumb is that as the TLC approaches .90 the model fits quite well (F. Bryant, personal communication, Nov. 3, 1983).

Mathematical approaches. A very popular criterion is to retain those factors with eigenvalues greater than one when the correlation matrix with unities on the diagonal is decomposed. According to Gorsuch (1974), Guttman (1954) proved that, when population correlations are being considered, this criterion is mathematically equivalent to estimating the rank of the matrix and it establishes the lower bound for the number of factors. However, when the sample correlations are considered, this criterion can provide either an over or an under estimate of the correct number of factors.

The popularity of the eigenvalue greater than one criterion is based on its heuristic and practical value more so than on its sophisticated mathematical derivation. This criterion is easy to apply and generally gives results consistent with researchers' expectations (Kim & Mueller, 1982). This criterion was used as a benchmark for evaluating the number of factors in this study, but it was not applied blindly without consideration of other approaches for determining the number of factors.

Approaches for extracting non-trivial factors. These methods are used to estimate the number of non-trivial factors (Gorsuch, 1974). One method is to specify the cumulative percent of variance extracted by all the factors. When the unadjusted correlation matrix with unities on the diagonal is used, the amount to specify is the total variance accounted for. It is obtained by dividing the sum of the eigenvalues (or characteristic roots) of the factors extracted by the sum of all the variances, which in this case is equal to the number of variables. When the adjusted correlation matrix with communality estimates on the diagonal is used, the amount to specify is the amount of common variance extracted. The researcher can specify any amount of variance such as 75, 80, or 85 percent (Gorsuch, 1974). The criterion applied in this study was that the factors should account for at least 50 percent of the total variance. The reason for specifying a low amount was that since a large number of variables was used it was likely that the amount of error variance was also large.

Kim and Mueller (1982) described a similar criterion called substantive significance. This is the amount of variance that should be accounted for by the last (or smallest) factor retained. Some possible values are 1, 5, or 10 percent.

Another closely related criterion is the scree test (see Gorsuch, 1974; Kim & Mueller, 1982). This criterion is based on the pattern or change in eigenvalues (or characteristic roots) rather than specification of a predetermined cutoff. The idea is that when the eigenvalues drop dramatically in size, then an additional factor would contribute relatively little to the information already extracted. The test is applied by examining a plot with the eigenvalues (or roots) on the ordinate and the number of factors on the abscissa. The point where the eigenvalues begin to level off and form an almost straight line is the appropriate number of factors. Factors beyond that point are referred to as factorial litter or scree (referring to the debris which collects on the lower part of a rocky slope) (Kim & Mueller, 1982). The researcher must then decide whether to take the number of factors just before the straight line begins or to include the first factor in the straight line. Gorsuch (1974) recommended the former.

In practice, application of the scree test is not so straightforward. Sometimes no clear break appears in the plot or else several different breaks appear. The number of factors to retain is left up to the judgement of the researcher. Aside from this uncertainty, the scree test does provide the solution with the smallest number of factors that account for the maximum amount of variance (Gorsuch, 1974).

In this study, the scree test was used in combination with the eigenvalue greater than one criterion and the percent of variance extracted criterion, because they could all be applied to the same set of eigenvalues.

Interpretability and practicality. The consensus among most factor analysis specialists (e.g., Alwin & Jackson, 1979; Joreskog, 1969; Kim & Mueller, 1982) is that the ultimate criterion for choosing the best number of factors depends on the usefulness of the results for the objectives of the research. Given the complexities as well as uncertainties in factor analysis methods, researchers must make the final judgement on the best number of factors after a careful analysis of all the information available. In the final analysis the solution must be interpretable, meaningful, and practical in light of the objectives of the research. The recommendation of Kim and Mueller (1982) and Gorsuch (1974) is to examine a combination of various rules and accept the conclusions that are supported by several independent criteria.

Reliability and replicability. Two additional procedures were used in this study to further substantiate the decision on the number of factors to retain. First alpha reliability coefficients were computed for each factor using the SPSS reliability program (Hull & Nie, 1979). These coefficients were used to confirm the internal consistency and homogeneity of the factors. The criterion was that solutions which produced factors with high internal consistency were better than solutions that produced factors with low internal consistency. Furthermore, when deleting an item from a factor increased the reliability

index by several hundredths of a point the item should be deleted or placed on a different factor.

Finally, for any given factor solution, the sample was randomly split in half and an attempt was made to crossvalidate the factors on both halves of the sample (cf. Bryant & Veroff, 1982). The criterion was that it should be possible to at least name the factors the same in both solutions, even if not all the items loaded on exactly the same factor in both halves.

Different methods of factor analysis, maximum likelihood (ML) versus principal factor analysis (PRINIT), and rotation, oblique versus orthogonal, were also compared. The purpose of this comparison was not to determine the number of factors but rather to compare the differences that may have resulted due to these different methods. ML is a more sophisticated procedure in that it has a complex system for weighting the communalities, but it has also been found to be more time consuming and costly to run even on large high speed computers (Jackson & Chan, 1980). Theoretically, the preference was for orthogonal rotation in order to produce independent factors, but sometimes oblique rotation provides a more interpretable solution (Kim & Mueller, 1982). It was expected that orthogonal rotation would be most appropriate for the activity and knowledge items, but oblique rotation would be most appropriate for the ability items, because individual abilities tend to be highly correlated due to a general ability factor.

It was expected that combining the results from all these different procedures for determining the number of factors would result in

reliable, valid, and replicable factors for the activity, knowledge, and ability items. Once the factors were identified, the aim was to analyze differences in factor scores across functions and levels. The characteristics of the functions and levels are described below.

### Independent Variables

The two independent variables were organizational functions and hierarchical levels. The characteristics of these variables are summarized below.

Organizational levels. Four organizational levels were established on the basis of management/professional salary points (MP points) that had been assigned to the jobs for salary administration purposes. In this sample the MP points ranged from 213 to over 2000, with a mean of 572 and a standard deviation of 329. The four levels, the number of people in each level, and the mean MP points for each level are shown in Table 1. The missing data were due to jobs for which MP points were not available. A number of these jobs were sales representative positions which were paid on a commission basis rather than a fixed salary. The level divisions were chosen in an effort to obtain equal numbers of jobs in the three top levels (L. Hoel, personal communication, Oct. 2, 1983). The sample size in the lowest level was quite a bit larger than in the other levels. This is characteristic of most management hierarchies in which more jobs are available in lower levels than in upper levels. The mean MP points for the two upper levels were above the overall mean, whereas, the mean MP points for the

two lower levels were about the same as the overall mean or below. The top executive level had the widest range of MP points because the very top jobs in the organization were in this category.

TABLE 1  
Sample Characteristics of Four Organizational Levels

Level	MP Point Range	N	Mean MP Points
Supervisory/Entry	213-549	418	380
Beginning Management	550-649	111	585
Middle Management	650-799	105	699
Executive	800 and up	124	1099
	Missing	<u>124</u>	
	Total	882	

\*The overall mean was 572.

Organizational functions. The organization was divided into 14 functional areas. The functions, the number of people in each function, and the mean MP points for each function are listed in Table 2. This table shows that data were available on both MP points and functional area for 758 of the people in the total sample, or, in other words 124 people had either missing MP points or function identification. In analyses that did not require identification of levels or

functions (i.e., factor analyses) the total sample of 882 people was used, but when level and function identification were required the sample of 758 was used. All the people in the sample had valid data on the the task, knowledge, and ability ratings regardless of availability of function or level identification.

A few of the functions (Public Affairs, Legal Affairs, Executive, and Business Planning and Development) had small sample sizes, but they were included in the analyses because their characteristics were of interest and could be helpful in the interpretation of the results. They all represented relatively high level jobs as indicated by the mean MP points. The Executive group was especially interesting because it included only the very top level jobs in the whole organization. This group could be useful for identifying the characteristics of the highest level executive jobs and how they differ from other levels. The functions with relatively large sample sizes, for example, Sales, Manufacturing, Operations, and R&D, represent the major functions of the organization.

### Summary of Research Design

The overall goal was to first identify the important task, knowledge and ability factors of management and professional jobs using exploratory factor analysis. These factors would be the basis for a taxonomy of management job activities and personnel requirements. These factors would be applicable to a wide range of jobs in different functional areas and levels.



TABLE 2

## Sample Characteristics of Fourteen Organizational Functions

Functional Area	N		Mean MP Points
Administration/Staff Support	30	(30)**	453
Business Planning and Development	12	(12)	964
Electronic Data Processing (EDP)	49	(45)	437
Operations/Distribution	95	(92)	525
Finance	63	(59)	541
Materials Service/Purchasing	32	(32)	420
Legal Affairs	6	(6)	1020
Sales/Marketing	215	(136)	610
Personnel	56	(56)	658
Regulatory Affairs (RA/QA/QC)*	76	(75)	508
Research and Development (R&D)	97	(89)	557
Manufacturing	116	(114)	532
Public Affairs	3	(3)	1017
Executive	10	(9)	1938
Missing	<u>22</u>		
Total	882 (758)		

\* RA/QA/QC stands for Regulatory Affairs/Quality Assurance/Quality Control.

\*\* The number in parentheses shows the number of people for whom data were available for both function and MP points. The difference between the N and the number in parentheses represents the number of people who had missing data on MP points.

The second goal was to identify differences in the job factor scores across the different organizational levels and functions. The purpose of the second goal was twofold: 1) to validate the factors by showing that the differences in factor scores across the functions and levels came out as would be generally expected, and 2) to show the characteristics and requirements of the different job groups, which would form the basis for linking personnel practices to job requirements. Multivariate analysis of variance (MANOVA), with the 14 functions and four levels as the independent variables and the task, knowledge, and ability factors as the dependent variables, was the data analysis strategy used to identify the factor score differences across the various job groups. The results are summarized in the next section.

## RESULTS

### Reliability of Ratings

Four items in the task activity section of the inventory were repeated to provide an estimate of the overall reliability of the data. The mean correlation between the four pairs of items was .78 with a range from .73 to .84. These correlations were considerably higher than the mean inter-correlation across all items which was .19 (S.D.=.16). The correlations between the repeat items corresponded to a mean alpha reliability of .87 for the item pairs. These results indicated that respondents answered carefully and consistently when completing the task activity section of the inventory.

Another indication of the overall quality of the data was obtained by having the respondents indicate how adequately their completed inventories represented their jobs. These ratings were made on an eleven point scale, with 10 percent gradations from 0% to 100%, where 100% equalled adequate representation of the job. The mean rating on this scale was 7.6 (or 76%), and the majority of respondents (77%) indicated that their completed inventories represented 70, 80, or 90 percent of their jobs. This indicated that the inventory covered most of the jobs quite completely. Those who rated it lower (e.g., 70%) may not have had the most unique aspects of their jobs represented.

TABLE 3

## Adequacy of Coverage Ratings by Functions and Levels

---

<u>Functional Area</u>	<u>Adequacy of Coverage Rating*</u>
Administration/Staff Support	7.03
Business Planning and Development	8.08
Electronic Data Processing (EDP)	7.24
Operations/Distribution	7.44
Finance	7.50
Materials Service/Purchasing	7.91
Legal Affairs	7.50
Sales/Marketing	7.65
Personnel	8.28
Regulatory Affairs (RA/QA/QC)	7.67
Research and Development (R&D)	7.06
Manufacturing	7.79
Public Affairs	7.33
Executive	8.10
<u>Level</u>	
Supervisory/Entry	7.43
Beginning Management	7.35
Middle Management	7.90
Executive	8.02

---

\*Ratings were made on an eleven point scale from 0=0% coverage to 10=100% coverage of the job. The overall mean rating was 7.58.

As shown in Table 3, no large differences were evident in adequacy of coverage ratings across different levels and functions. There was a slight tendency for higher level functions (e.g., Executive, Personnel, and Business Planning and Development) to give higher than average ratings of coverage. However, this was not entirely consistent. Public Affairs had a rating below the overall mean, whereas Materials Service/Purchasing, a lower level function, had a relatively high rating. The ratings across the four levels indicated a slight tendency for better coverage of higher level jobs, but the differences were not large.

### Task Activity Factors

#### Chi-square Significance Tests

The task activity data were the most difficult to factor analyze because of the large number (222) of variables involved. The results of the chi-square significance tests for different numbers of factors are shown in Table 4. An attempt was made to find the point where adding another factor produced a nonsignificant change in chi-square. The test is made by subtracting the chi-square and degrees of freedom for any given solution from the chi-square and degrees of freedom for the solution with one less factor. The test for significance is then applied to the difference chi-square and degrees of freedom (F. Bryant, personal communication, Nov. 3, 1983). The result of increasing the number of factors from 61 to 62 was highly significant,  $\chi^2(161) = 283.14$ ,  $p < .05$ . This result supported the findings of other research-

TABLE 4  
Chi-square Significance Tests for Task Activity Factors

Number of Factors	$\chi^2$	DF	$\chi^2/DF^*$	TLC*
0	157,772.3	24,531	6.43	-
-				
8	53,066.9	22,783	2.33	.76
9	50,320.5	22,569	2.23	.77
-				
15	39,150.9	21,306	1.84	.85
16	37,918.9	21,099	1.80	.85
-				
21	32,752.5	20,079	1.63	.88
22	31,967.5	19,878	1.61	.89
23	31,208.0	19,678	1.59	.89
-				
32	25,471.6	17,923	1.42	.90
33	24,919.4	17,733	1.41	.90
-				
61	14,420.4	12,819	1.12	.98
62	14,137.3	12,658	1.12	.98

\*As this ratio approaches zero the fit of the model improves.

\*\*As the Tucker-Lewis coefficient approaches 1.0, the fit of the model improves (Bryant & Veroff, 1982).

ers who found that, when the sample size and number of variables are large, the number of significant factors tends to be more than the researcher is willing to accept (Kim & Mueller, 1982). It was decided that it was not necessary to find the point where adding another factor produced a nonsignificant change in chi-square, but rather that any number of factors eventually retained would definitely be significant.

Applying the rules of thumb for the ratio of chi-square to the degrees of freedom and the TLC indicated that the appropriate number of factors was between eight and 23. The ratio of chi-square to degrees of freedom approached 2.00 at eight factors, and the TLC approached .90 at 23 factors.

### Eigenvalues Greater Than One

The next step was to examine the eigenvalues for the task activity factors when the unadjusted correlation matrix with unities on the diagonal was factored. Thirty-three factors had eigenvalues greater than one, and so the 33 factor solution was examined. The 33 factors accounted for 68% of the total variance and 91% of the common variance. Very little difference was found between the principal factor analysis (PRINIT) and the maximum likelihood (ML) factor analysis solutions with the same number of factors. The oblique rotation produced a more differentiated solution in which more factors were interpretable than with the orthogonal rotation. Twenty-eight factors were meaningful and interpretable in the 33 factor solution with oblique rotation. These factors held up in a cross-validation on the random halves of the sample.

## Higher-Order Factor Analysis

Even though the 28 factors were meaningful and interpretable, 28 factors were too many to be practically considered as fundamental dimensions of management and professional jobs. Therefore, a higher-order factor analysis was done in an effort to identify more general dimensions of management and professional jobs, and to aid in the interpretation of the lower-order factors. Factor scores were computed for each subject on each of the 28 lower-order factors. Factor scores were simply the average of the ratings for all the items that loaded on a factor, and each item was assigned to only one factor. These factor scores were then factored and six meaningful and interpretable higher-order factors were identified.

The 28 lower-order factors are listed under the six higher-order factor groups in Table 5, along with the mean importance ratings, reliabilities, and number of items on each of the 28 lower-order factors. Most of the higher-order factors corresponded to major functional areas of the organization (e.g., Sales, Operations, Finance, and Legal). The lower-order factors indicated some of the more specific activities related to each of the functional areas.

In order for a factor to obtain a high overall mean importance rating, it had to be rated high in importance by a majority of people in the sample. Thus, overall mean importance ratings reflected both the number of people who rated the items on each factor as important, and the absolute level of the ratings. High ratings reflected both high importance and relevance to a wide range of different jobs. Low



TABLE 5

## Twenty-eight Task Factors in Higher-Order Factor Groups

Factor Name	Mean* Importance	Alpha Reliability	Number of Items
<u>General Management</u>			
Orienting/Training Others	2.17	.74	5
Managing Others	2.04	.97	25
Interacting with Others	2.45	.91	20
Establishing/Monitoring Policies	1.82	.82	7
Problem Solving	2.65	.82	7
Resolving Conflicts	1.89	.82	5
Improving Work Methods	2.46	.81	4
Record Keeping	1.98	.73	4
Planning/Monitoring Actions	2.40	.82	4
<u>Sales and Marketing</u>			
Selling and Marketing	1.21	.96	22
Contracting	1.05	.83	3
Persuading Others	2.80	.86	3
Creative Writing	.49	.71	4
Public Affairs	.75	.73	4
<u>Operations</u>			
Mechanical Design/Evaluation	.88	.88	8
Materials/Supplies Control	1.50	.85	4

(Continued on following page)

(Table 5 continued)

Dealing with Outside Contractors	1.60	.82	7
Quality Control	1.20	.80	5
<u>Organization Planning/Finance</u>			
Develop Financial Strategies	1.04	.85	2
Accounting	.62	.86	9
Production Planning	.94	.73	4
Planning/Decision Making	1.48	.95	24
<u>Research</u>			
Research Design/Analysis	1.61	.90	16
Dealing with Technical Information	2.33	.74	4
Computer Applications	.76	.76	3
Report Preparation/Presentation	2.17	.81	6
<u>Legal Affairs</u>			
Providing Legal Advice	.45	.80	6
General Consulting	.69	.68	3

---

\*Ratings were made on a five point scale of importance for successful job performance (0=Not Required; 2=Some Importance; 4=Critically Important).

importance ratings reflected either low general importance or relevance to only a narrow range of jobs.

As shown in Table 5, the lower-order factors that dealt with General Management activities had the highest overall mean importance ratings. This indicated that the General Management activities were performed by most of the management/professional employees in the sample, whereas the other activities were performed only by people in specific functional areas. For example, Providing Legal Advice was probably done by only a small number of professionals, as indicated by its low mean importance rating.

Within the General Management higher-order factor, Problem Solving, Improving Work Methods, Interacting with Others, and Planning/Monitoring Actions had the highest importance ratings. Within the other higher-order factors, Persuading Others, Dealing with Technical Information, and Report Preparation/Presentation appeared to be important to a majority of management and professional jobs.

The six higher-order factors paralleled the dominant factors that accounted for the largest amounts of variance from the 28 factor lower-order solution. However, some of the factors that accounted for large proportions of variance in the lower-order solution were combined in the higher-order solution. For example, Managing Others and Interacting with Others were two large factors from the lower-order solution, which were combined in the higher-order solution. Also, Planning/Decision Making, and Accounting were large factors in the lower-order solution, which were combined in the higher-order solution. It appeared

that the six factor higher-order solution obscured some of the important management/professional job activities. Furthermore, the mean of the reliabilities for all 28 lower-order factors shown in Table 5 was .82, and several factors had reliabilities in the low .70's. Higher reliabilities could be obtained with a smaller number of factors and more items on each one.

### Identification of Non-trivial and Reliable Task Factors

It was decided that a more satisfactory solution might be obtained by reducing the whole set of 222 task activity items into a smaller number of factors rather than using the higher-order factor results. The prior results indicated that the "best" number of factors was probably slightly more than six but less than 28. The eigenvalues of the unadjusted correlation matrix with unities on the diagonal were examined in terms of percent of variance accounted for and the scree test in order to obtain another indication of the appropriate number of factors. The eigenvalues and the percent of variance accounted for are shown in Table 6, and the scree plot of the eigenvalues is shown in Figure 1.

The scree plot showed breaks at four and eight factors. Although the break at four factors was very clear, four factors was definitely too few, and the break at eight factors was more in line with the prior results. Table 6 shows that the first eight factors accounted for nearly 50% of the total variance, and the next largest factor accounted for only slightly more than one percent of the total variance. On the

TABLE 6

## Eigenvalues and Variance Accounted For by Task Factors

Number of Factors	Eigenvalues*	Percent of Variance	Cumulative Percent of Variance
1	48.3	21.8	21.8
2	20.3	9.2	30.9
3	12.3	5.5	36.4
4	7.8	3.5	39.9
5	6.8	3.1	43.0
6	5.6	2.5	45.6
7	4.8	2.2	47.8
8**	3.9	1.7	49.5
9	3.2	1.4	50.9
10	2.8	1.3	52.2
11	2.5	1.1	53.3
12	2.4	1.1	54.4
13	2.2	1.0	55.4
14	2.2	1.0	56.4
15	1.8	.8	57.2

\*Eigenvalues were derived from the unadjusted correlation matrix with unities on the diagonal.

\*\*Number of task factors finally retained.

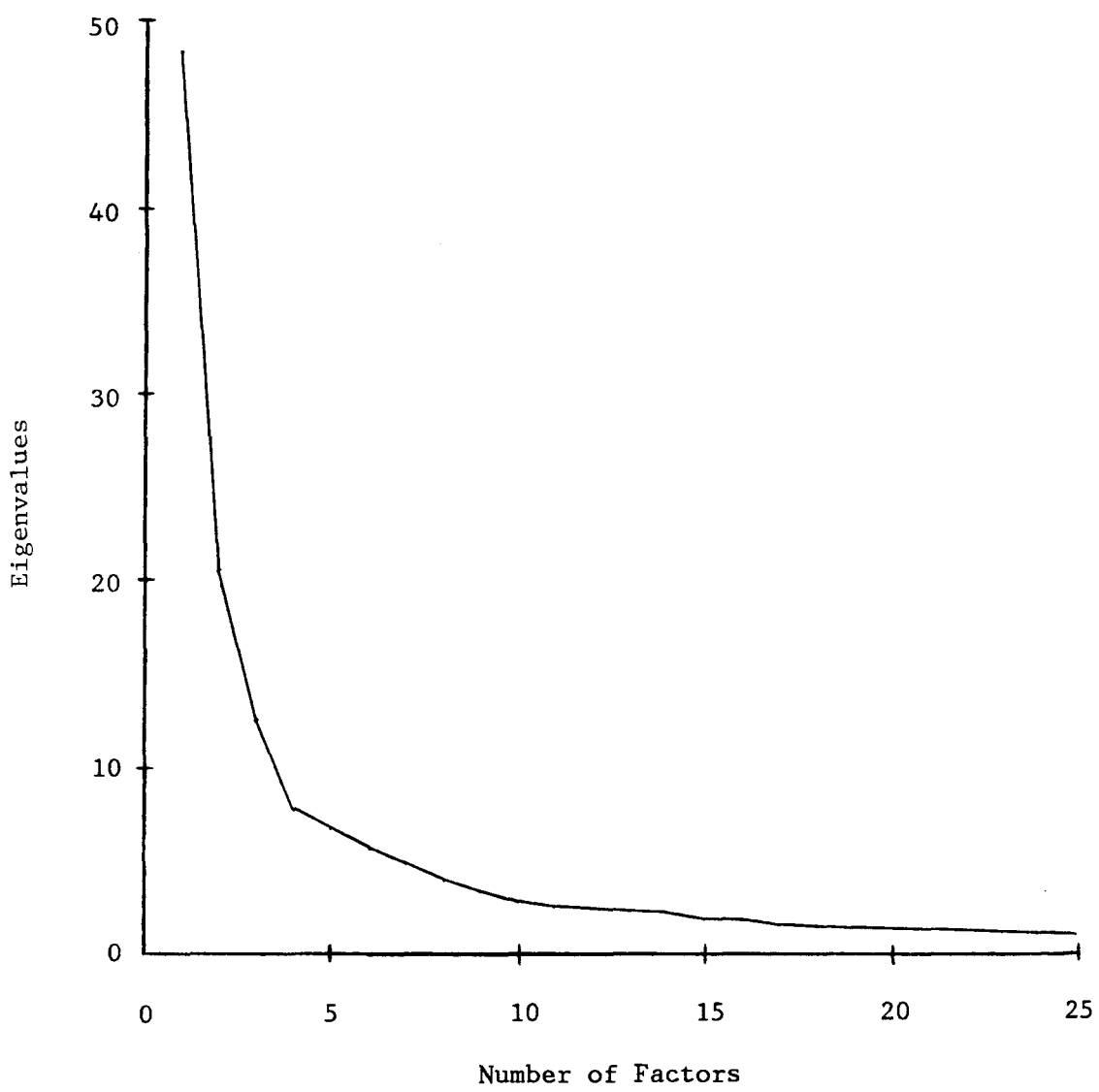


Figure 1: Scree Plot of Eigenvalues for Task Activity Factors

basis of these criteria, it appeared that the eight factor solution was appropriate.

There was little difference between the ML and the PRINIT eight factor solutions, and so the ML solution was chosen because it had been found to provide more accurate solutions when sample sizes were large (Bryant & Veroff, 1982). The orthogonal (Varimax) rotation resulted in a slightly simpler factor structure than the oblique (Promax) rotation, although the differences were not large.

The crossvalidation in random halves of the sample produced factors which could be named similarly in both halves, but compared to the full sample, some items loaded on different factors. Specifically, items from the Accounting factor loaded on the Planning/Decision Making factor, and the items left on the Accounting factor dealt mostly with Record Keeping. Otherwise, the factors crossvalidated quite well. The full sample solution was considered to be the most reliable and it was used as the final accepted solution.

### Dimensions of Management/Professional Job Activities

Overall, the eight factor solution resulted in meaningful and interpretable factors. The names and definitions of the factors based on a maximum likelihood factor analysis with orthogonal (Varimax) rotation are listed below. Some of the underlined phrases represent groups of items which were identified as separate factors in the 28 factor solution. Thus, the 28 factor solution was helpful for interpretation of the eight factor solution. The specific items that loaded on each factor are listed in Appendix B.

1. Managing Others - This factor involved direct on the job supervision of employees, which included scheduling work, determining work goals and procedures, delegating, evaluating performance, helping with work problems, developing subordinates, and counseling on personal problems. Another part of this factor was staffing, which included recruiting, interviewing, hiring, orienting, and training new employees. This factor also involved explaining and monitoring compliance with company policies or safety rules.
2. Planning/Decision-Making/Controlling - This factor involved long-range strategic planning in the areas of business development, financial strategies, policies, programs, organizational structure, human resources, budgets, and resource scheduling. It also involved decision making on matters such as approval of budgets, approval of new products, establishing planning guidelines for others to follow, managing stocks and other assets, and deciding on the most efficient operational procedures. It also involved controlling by budget review, monitoring performance and efficiency of operations, setting up internal business controls and reviewing proposals. In addition, it involved communicating these plans, decisions, and controls in meetings and reports. It could also involve handling difficult conflicts between departments, and emergency action planning.
3. Selling and Marketing - This factor involved some direct selling of company products, using sales techniques, contacting customers, and negotiating agreements and contracts. It also involved sales and market planning by establishing sales goals, improving sales



results, developing new markets, advertising, pricing products, and evaluating new competitive products. It also involved some concerns about public relations.

4. Interacting with Others - This factor involved a great deal of interaction with others to exchange information, accomplish goals, solve problems, persuade others, improve work methods, coordinate meetings, or provide specialized advice. These contacts were often with people in different functional areas and in informal meetings or groups. It could involve work on a committee or task force. The focus of these contacts was on problem solving and improving work methods.
5. Engineering/Production - This factor involved responsibility for efficient operation of machines, equipment, and facilities. It involved performing engineering evaluation, reading blueprints, designing equipment and facilities; improving technical capabilities, analyzing equipment or procedures for cost effectiveness, and solving manufacturing problems; scheduling materials or equipment to meet needs; performing quality control tests, and arranging for the services of outside contractors. This factor was technical and materials oriented as opposed to people oriented.
6. Research Design and Analysis - This factor involved designing experiments and studies, stating research objectives, analyzing data and reports, interpreting research results, writing technical or analytical reports, reviewing published literature, and creating new products or services. It could also involve acting as a project leader, technical consulting, and computer programming.

7. Accounting - This factor involved keeping track of the company's financial matters, compiling financial reports, using accounting procedures, doing financial audits, keeping accurate records, and overseeing revenues due the company. It could also involve maintaining proper inventory levels and recording output.
8. Managing Legal Affairs - This factor involved dealing with all legal matters relevant to the company, such as providing legal advice to management, preparing for potential litigation, consulting with lawyers and government representatives, writing position papers, and monitoring adherence to contracts by external concerns. It could also involve preparing material for policy manuals and news releases to the public.

Three of the eight factors, i.e., Managing Others, Interacting with Others, and Planning/Decision Making/Controlling, dealt with general process activities and were not related to any technical specialty areas. The Managing Others factor dealt with direct supervision of subordinates, including scheduling work, setting work goals, and evaluating performance. It also included a staffing function which involved selecting and training new employees. Items dealing with interpretation and explanation of company policies also loaded on this factor.

The Planning/Decision Making/Controlling factor seemed oriented toward upper level executive jobs. It dealt with the long-range plans and objectives of the company. Financial matters were a big part of this factor, including long-range financial planning, approval of financial commitments, preparation of budgets, and internal business

controls. The factor involved the authority to make final approvals or decisions about major issues affecting the company, such as the introduction of new products, changes in organizational structure, and allocation of resources. It also involved monitoring the efficiency of operations, resolving conflicts, and participating in emergency action planning.

The Interacting with Others factor was the most general in that it was not linked to any specific function or level of jobs. The focus of the factor was on exchanging information to solve problems and improve work methods. It involved formal or informal contacts with coworkers or with people outside one's immediate work area. Communicating effectively, encouraging openness and cooperation in others, and persuading others to change their point of view were important activities on this factor.

The other five factors, Selling and Marketing, Engineering/Production, Research Design and Analysis, Accounting, and Managing Legal Affairs, involved technically oriented tasks and were related specific functions of the organization. For example, the Sales factor was related to the sales and marketing function. Engineering/Production was related to manufacturing, operations, materials, and quality control functions. The Research factor was related to the research and development function. However, the Research factor also included some activities that could be related to many different jobs that were not directly involved in research. For example, analyzing and writing reports, and reviewing published literature could be important activi-

ties on jobs that were not directly involved in research per se. The Accounting factor was linked to the finance function, but it also included general record keeping activities that could be relevant to jobs outside the finance function. The Legal factor was quite specifically linked to the legal affairs function, but it also included dealing with government representatives and writing position papers, which may not be limited to jobs in the legal area per se.

### Importance and Reliability of Task Factors

The overall mean importance ratings, alpha reliabilities, and number of items on each factor are shown in Table 7. Interacting with Others had the highest overall mean importance rating. This indicated that problem solving, improving work methods, and communicating with others were some important activities for most management and professional jobs. The next highest mean rating was for Managing Others. It was expected that this factor would be important since the focus of the study was on management jobs. However, the mean rating for Managing Others was considerably lower than the mean for Interacting with Others, which indicated that Managing Others was not quite as widespread an activity as Interacting with Others.

The next highest importance ratings were for Research Design and Analysis and Planning/Decision Making/Controlling. These factors had overall mean ratings about a half point below Managing Others. This suggests that these activities were performed by a more specific group than the Managing activities. The Selling and Marketing, Engineering/

TABLE 7

## Mean Importance Ratings and Reliabilities for Task Factors

Task Activity Factors	Overall Mean*	Standard Deviation	Alpha Reliability	Number of Items
Managing Others	2.07	1.05	.97	31
Planning/Decision Making	1.54	.88	.97	43
Selling and Marketing	1.22	.92	.96	35
Interacting with Others	2.48	.65	.94	37
Engineering/Production	1.32	.79	.93	28
Research Design/Analysis	1.57	.75	.90	21
Accounting	1.16	.74	.86	14
Managing Legal Affairs	.84	.63	.83	13

\*Ratings were made on a five point scale of importance to the job, (0=Not Required; 2=Some Importance; 4=Critically Important). Individual items were assigned to the factor on which they had the highest loading. The overall mean was simply the average of the ratings for all the items on each factor, averaged over the total sample (N=874, eight cases were deleted due to coding errors).

Production, Accounting, and Legal Affairs factors had the lowest overall mean ratings. These technically oriented activities were probably rated as important only by people in directly related functional areas. The analyses in a later section will show the importance ratings on each factor for each functional area.

The alpha reliability ratings for the task activity factors were very high. The mean reliability across all the factors was .92 with a range from .83 to .97. These reliabilities were much higher, on the average, than the reliabilities for the 28 factor solution discussed earlier. The mean reliability for the 28 factor solution was .82 with a range from .68 to .97. The mean reliability was greatly improved with the smaller number of factors. This improvement was aided by having a large number of items on each factor.

Overall, the task activity factors were meaningful, reliable, and informative. The importance of task activity factors to the different organizational functions and hierarchical levels is presented in a later section. The technical knowledge factor analysis results are presented in the next section.

## Technical Knowledge Factors

### Identification of Nontrivial and Reliable Factors

The technical knowledge requirements of management/professional jobs were measured with 65 items that resembled college curriculum majors or course offerings. The eigenvalues of the unadjusted correlation matrix and the percent of total variance accounted for by each

factor are shown in Table 8. Eleven factors had eigenvalues greater than one, and so the eleven factor solution was examined.

Overall, the eleven factor solution was very interpretable and the factors were clear and meaningful. However, the smallest factor only had one item load on it, and another factor with four items had a low internal reliability (.69). Thus, eleven factors appeared to be slightly too many.

The scree plot of the eigenvalues is presented in Figure 2. The scree plot showed breaks at four and nine factors. The break at nine factors was in line with the results from the eleven factor solution which produced two trivial or unreliable factors. As shown in Table 8, nine factors accounted for about 63% of the total variance and the next two factors did not substantially increase the amount of variance accounted for.

Finally, the results of the chi-square significance tests for different numbers of factors are shown in Table 9. The change in the chi-square from 10 to 11 factors was  $\chi^2(55) = 526.29$ ,  $p < .05$ , and so 11 factors or less were definitely statistically significant. The TLC was approaching .90 in the range of eight to 11 factors. The ratio of chi-square to degrees of freedom was still quite a bit above 2.00, but it appeared to be decreasing more slowly from nine to 10 factors, and from 10 to 11 factors, than it did from eight to nine factors. It may be possible to interpret the change in the ratio of chi-square to degrees of freedom much the same as the change in eigenvalues is interpreted in the scree test. If so, the chi-square tests provided more

TABLE 8  
Eigenvalues For Technical Knowledge Factors

Number of Factors	Eigenvalues*	Percent of Variance	Cumulative Percent of Variance
1	14.7	22.6	22.6
2	8.1	12.5	35.1
3	5.0	7.7	42.8
4	2.9	4.5	47.4
5	2.6	4.0	51.4
6	2.4	3.7	55.1
7	2.0	3.0	58.1
8	1.6	2.4	60.5
9**	1.3	2.1	62.6
10	1.3	2.0	64.6
11	1.1	1.6	66.2
12	.9	1.4	67.7
13	.9	1.4	69.1
14	.9	1.4	70.5
15	.9	1.3	71.8

\*Eigenvalues were derived from the unadjusted correlation matrix with unities on the diagonal.

\*\*Number of technical knowledge factors finally retained.



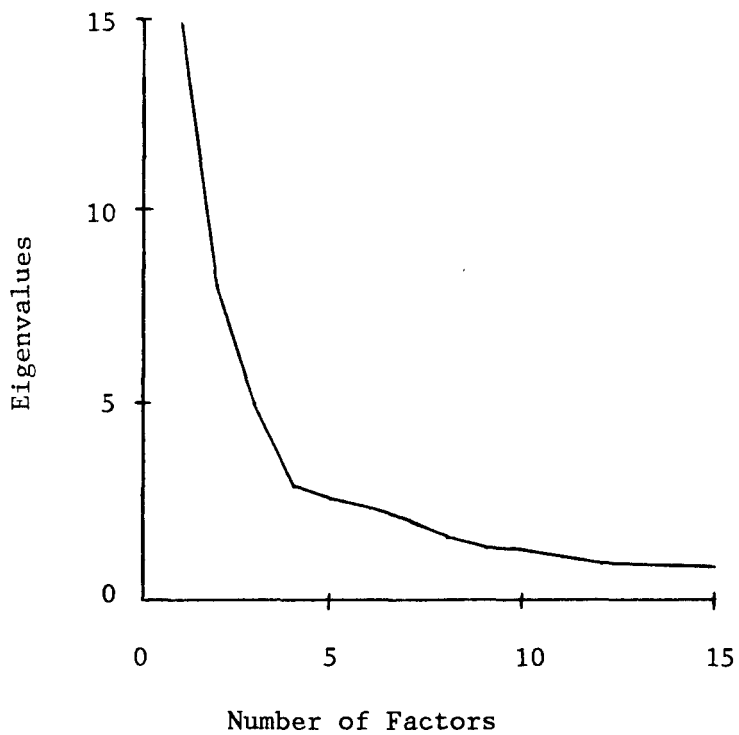


Figure 2: Scree Plot of Eigenvalues for Technical Knowledge Factors

TABLE 9

## Chi-square Significance Tests for Technical Knowledge Factors

Number of Factors	$\chi^2$	DF	$\chi^2/DF^*$	TLC**
0	39,703.9	2080	19.1	-
-				
8	6,824.2	1588	4.3	.82
9	5,712.3	1531	3.7	.85
10	5,074.0	1475	3.4	.87
11	4,547.7	1420	3.2	.88

\*As this ratio approaches zero the fit of the model improves.

\*\*As the Tucker-Lewis coefficient approaches 1.0, the fit of the model improves (Bryant & Veroff, 1982).

evidence that nine factors was the appropriate number of technical knowledge factors.

The nine factor solution was accepted as the best solution for the technical knowledge items. Very little difference was found across different methods, ML versus PRINIT, or different rotations, orthogonal (Varimax) versus oblique (Promax). The ML solution was finally used because it is the more technically advanced method, and orthogonal rotation was used on the logical grounds that the technical knowledge areas should be relatively independent and uncorrelated. The nine factor maximum likelihood solution accounted for 63% of the total variance and 93% of the common variance. The names and definitions of the nine factors are listed below. The specific items that loaded on each factor are listed in Appendix C.

### Management/Professional Technical Knowledge Requirements

1. Biochemistry/Medical - This factor involved knowledge of chemistry, microbiology, bio-chemistry, industrial health, medical science, biology, medicine, pharmacology, clinical research, quality control techniques, regulatory affairs, sterilization, nursing, statistics, and mathematics.
2. Engineering - This factor involved knowledge of all areas of engineering, including mechanical, electrical, industrial, research and development, civil/structural, and quality. It also involved knowledge of graphic arts/drafting, physics, energy resources/ecology, and facilities management.

3. Sales and Marketing - This factor involved knowledge of sales management, marketing management, selling techniques, marketing research, product management, advertising, pricing, and public relations.
4. Finance/General Management - This factor involved knowledge of accounting, finance/banking/taxation, financial management, auditing, business planning, general business administration, general management, law, and international business.
5. Personnel - This factor involved knowledge of personnel management, psychology/counseling/personnel research, industrial relations, compensation, instructional methods/classroom instruction, government affairs/civics, creative writing, and real estate.
6. Distribution - This factor involved knowledge of transportation/shipping/receiving, inventory control, purchasing, distribution, customer service, operations, packaging, and office management. It involved logistical knowledge important for the flow of materials and products.
7. Production/Manufacturing - This factor involved knowledge of production management, production planning, and good manufacturing procedures.
8. Computers - This factor involved knowledge of computer hardware, computer software, and electronics and telecommunications.
9. Program Evaluation - This factor involved knowledge of program evaluation and program development.

Most of the technical knowledge factors paralleled functional areas of the organization, e.g., Sales and Marketing, Finance/General Management, Personnel, Distribution, Production/Manufacturing, and Computers. The Bio-chemistry/Medical factor reflected the specialty of the whole company. The Program Evaluation factor was the only knowledge factor that did not appear to be linked to any particular function or specialization within the organization. More about the relationship of the technical knowledge factors to the organizational functions is presented in a later section.

#### Importance and Reliability of Technical Knowledge Factors

The means, reliabilities, and number of items on each factor are shown in Table 10. The overall alpha reliabilities were quite high. The mean of the reliability coefficients was .87 with a range from .82 to .96. All the factors measured internally consistent and homogeneous constructs.

The mean importance ratings for the technical knowledge factors were quite low. To some extent, the means reflected the specialty relatedness of the factors. In other words, the majority of managers and professionals outside the area of specialization probably rated the specific knowledge items as not required. Some evidence was found for this explanation in an analysis of the ratings for a sample of five technical knowledge items. An average of 55% of the people in the sample rated the items as 0, not required, whereas only 3% rated the items as 4, in depth knowledge/ skill a must, licensing or certification may

TABLE 10

## Importance Ratings and Reliabilities for Knowledge Factors

Technical Knowledge Factors	Overall Mean*	Standard Deviation	Alpha Reliability	Number of Items
Biochemistry/Medical	.91	.78	.91	13
Engineering	.64	.73	.91	11
Sales and Marketing	1.13	.90	.89	8
Finance/General Mgt.	1.35	.76	.88	9
Personnel	1.06	.66	.80	8
Distribution	1.35	.80	.84	8
Production/Mfg.	1.21	1.06	.83	3
Computers	.98	.91	.82	3
Program Evaluation	1.61	1.17	.96	2

\*Ratings were made on a five point scale of extent required for successful performance (0=Not required, never used; 1=Somewhat helpful, but not required; 2=A definite asset, but not an absolute requirement; 3=A critical requirement; 4=Advanced in-depth skill a must, licensing or certification may be required.) Individual items were assigned to the factor on which they had the highest loading. The overall mean was simply the average of the ratings for all the items on each factor, averaged over the total sample (N=874, eight cases were deleted due to coding errors).

be required. The highest rating may have been used infrequently partly because it included the possible licensing or certification requirement, which may not have been required for many jobs.

The Program Evaluation factor showed the highest overall importance, followed by Finance/General Management, and Distribution. Engineering had the lowest overall importance rating, indicating that engineering knowledge may be required for a narrow range of jobs. The mean rating on the technical knowledge factors for each function and organizational level will be presented in a later section. The results of the individual ability factor analysis are presented in the next section.

### Individual Ability Factors

Forty-two individual ability items represented various abilities or capabilities, which managers and professionals might need in order to perform their jobs successfully. Many of the items reflected personality characteristics, such as self-confidence, assertiveness, and interpersonal relations. Others reflected administrative abilities such as leadership, communication, and decision making.

### Identification of the Appropriate Number of Factors

The eigenvalues and percent of variance accounted for by each factor of individual abilities are shown in Table 11. The large eigenvalue for the first factor followed by a quick drop to the second factor indicated the presence of a general ability factor which was

consistent with expectations. The subsequent factors accounted for much smaller proportions of variance, and six factors with eigenvalues greater than one accounted for 63% of the total variance.

The scree plot of the eigenvalues in Figure 3 showed a clear break at four factors and a less distinct break at seven factors. It also illustrated the huge drop from the first to the second factor.

The results of the chi-square significance tests for different numbers of factors are shown in Table 12. The change in chi-square from 16 to 17 factors was highly significant,  $\chi^2(27) = 63.6$ ,  $p < .05$ . This again supported the conclusion by Kim and Mueller (1982) that when sample sizes are large, the chi-square test will provide many more significant factors than the researcher is willing to accept. The TLC approached .90 at three factors and was over .90 with six factors. The ratio of chi-square to degrees of freedom was approaching 2.00 at seven factors, and so TLC and the ratio of chi-square to degrees of freedom indicated that the appropriate number of factors was between three and seven. This was consistent with the eigenvalue criterion and the scree plot.

On the basis of the above criteria, the appropriate number of factors was decided to be between three and six. The three factor solution resulted in interpretable factors that were named Impact, Work Style, and Leadership abilities. The six factor solution was also interpretable and added Results Orientation, Public Speaking, and Decision Making to the factors from the three factor solution. The latter three factors were interesting and could be used to show important dif-



TABLE 11  
Eigenvalues For Individual Ability Factors

Number of Factors	Eigenvalues*	Percent of Variance	Cumulative Percent of Variance
1	17.6	41.8	41.8
2	3.4	8.1	49.9
3	2.0	4.7	54.6
4	1.3	3.1	57.6
5	1.2	2.8	60.4
6**	1.1	2.6	63.0
7	.9	2.2	65.2
8	.8	2.0	67.1
9	.8	1.9	69.1
10	.7	1.7	70.8

\*Eigenvalues were derived from the unadjusted correlation matrix with unities on the diagonal.

\*\*Number of individual ability factors finally retained.

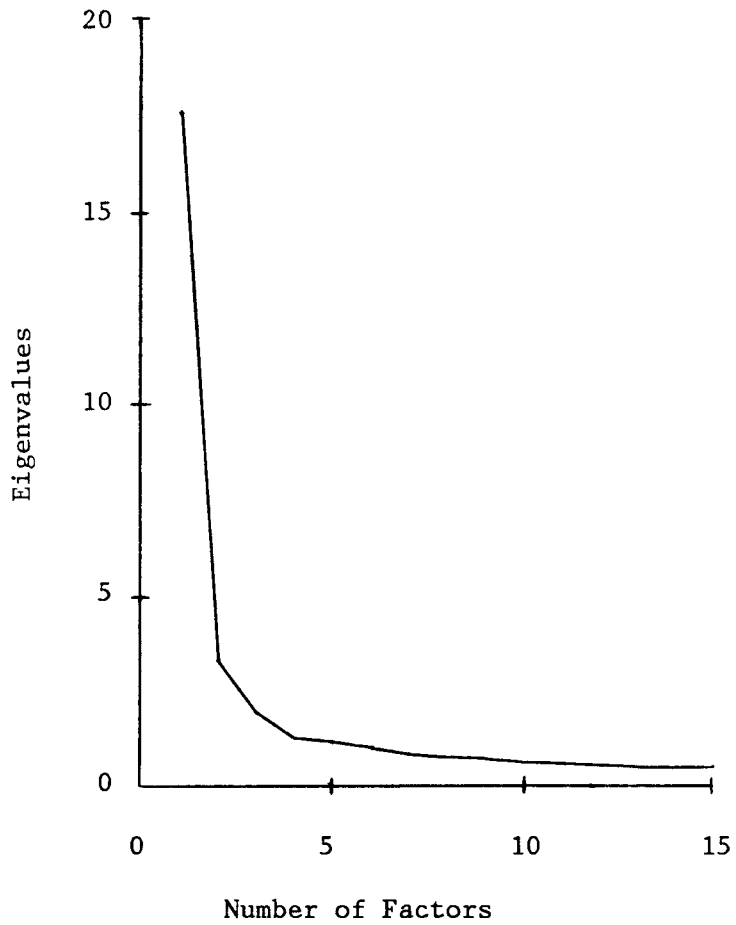


Figure 3: Scree Plot of Eigenvalues for Individual Ability Factors

TABLE 12

## Chi-square Significance Tests for Individual Ability Factors

Number of Factors	$\chi^2$	DF	$\chi^2 / DF^*$	TLC**
0	24,896.8	861	28.92	-
-				
3	3,356.5	738	4.55	.87
4	2,912.0	699	4.17	.89
5	2,449.6	661	3.71	.90
6	2,017.5	624	3.23	.92
7	1,625.2	588	2.76	.94
-				
13	757.1	393	1.93	.97
14	665.0	364	1.83	.97
15	578.0	336	1.72	.97
16	514.4	309	1.67	.98

\*As this ratio approaches zero the fit of the model improves.

\*\*As the Tucker-Lewis coefficient approaches 1.0, the fit of the model improves (Bryant & Veroff, 1982).

ferences between various management/professional jobs that would be obscured in the three factor solution. Therefore, the six factor solution was accepted as the most appropriate solution. The names and definitions of the six individual ability factors are listed below, and the specific items that loaded on each factor are listed in Appendix D.

### Management/Professional Individual Ability Requirements

1. Impact/Influence - The ability to have impact and influence on others. The willingness to supervise, motivate, and train others; to project self-confidence, to be tenacious, enthusiastic, and persuasive; to remain composed in difficult situations, communicate verbally, make unpopular decisions, be tactful, control departments, and have positive interpersonal relations.

Impact/Influence was the individual ability factor that accounted for the most variance and included one third of all the individual ability items. The items reflected personal characteristics and abilities that enable a person to influence others without negative consequences. Some of these characteristics were self-confidence, enthusiasm, tenacity, composure, and tactfulness. It also included the willingness to supervise and train others, to communicate verbally, and to maintain positive relations. This factor reflected a general theme that seemed to run through all the other individual ability factors, and it was probably the general ability factor that was related to all the others.

2. Lead Others - Ability to accept responsibility for the work of others; to be assertive, lead others, create a good first impression, plan and organize, develop subordinates, delegate, make decisions quickly, and listen attentively.

Lead Others dealt with leadership and administrative abilities, such as planning and organizing, delegating, and making decisions.

3. Work Style - To be able to work effectively with others, to be practical, to explain technical material, be creative, to communicate in writing, to work with little or no direction, and to be political.

This factor dealt with a variety of different abilities that all seemed related to communication and working effectively with others. Thus, it was called Work Style. It involved the ability to communicate technical material in creative ways, knowing when it is best to work independently, and when to consult others.

4. Results Orientation - The ability to produce consistently high quality work; to set high standards, maintain stable performance under pressure, to produce results in a timely manner, to be thorough, show initiative, work long hours, and to grasp new ideas quickly.

The Results Orientation factor was clearly the ability to produce high quality work in a timely manner under most any conditions. It reflected the ability to maintain stable performance, to set high standards, and to work long hours when necessary.

5. Public Speaking - The ability to make formal public presentations and to sell to the public or customers.

This factor consisted of two items that involved making formal presentations and selling to the public. These abilities would be required in sales, public relations, or other positions that involved public contact or making speeches.

6. Decision Making - The ability to make accurate decisions, to take risks, be objective, and to learn quickly.

This factor involved the ability to make accurate decisions, to take risks, and to be objective. Being objective and taking risks seem to be almost contradictory abilities. The riskiness is apparently tempered by objectivity and the ability to learn quickly. Anyone who has been actively involved in the stock market can probably recognize the type of decision making reflected by this factor.

More was learned about the nature of the individual ability factors by examining their correlations with the task activity factors. Impact/Influence, Lead Others, Work Style, and Decision Making, all correlated .55 or higher with the Interacting with Others task factor. This suggested that the individual ability factors reflected, to a large extent, interpersonal abilities required to work effectively with others. Lead Others correlated .83 with Managing Others, and .65 with Planning/Decision Making/Controlling task factors. Thus, the Lead Others factor reflected leadership and administrative abilities. Work Style correlated .53 with the Research task factor. This indicated that Work Style was related to the ability to communicate and get along with others when dealing with technical and research activities. Public Speaking correlated .77 and .70, respectively, with the Sales and

Marketing task and knowledge factors. Finally, Decision Making ability correlated .51 with the Planning/Decision Making/Controlling task factor. These correlations helped to demonstrate the construct validity of both the task and ability factors.

### Importance and Reliability of Ability Factors

The mean importance ratings, alpha reliabilities, and the number of items on each individual ability factor are shown in Table 13. The overall importance ratings were uniformly high for the individual ability factors. This indicated that interpersonal, leadership, and administrative abilities were generally considered quite important for most management and professional jobs. Results Orientation had the highest overall importance rating, followed closely by Impact/Influence, and Work Style. Only the Public Speaking factor had a relatively low overall importance rating, but it also had the highest standard deviation. This indicated that it was probably quite important for some jobs but not important for others. The alpha reliabilities were quite high for the individual ability factors overall, with a mean reliability of .84 and a range from .72 to .94. The reliability for the Public Speaking factor was not really very low considering that it was made up of only two items.

Once the factors were identified and defined, the next step was to analyze differences in factor scores among jobs in different organizational functions and hierarchical levels. The results of these analyses are presented in the next section.

TABLE 13

## Importance Ratings and Reliabilities for Ability Factors

Individual Ability Factors	Overall Mean*	Standard Deviation	Alpha Reliability	Number of Items
Impact/Influence	2.94	.70	.94	14
Lead Others	2.40	1.01	.93	8
Work Style	2.77	.66	.82	7
Results Orientation	3.01	.67	.86	7
Public Speaking	1.65	1.20	.72	2
Decision Making	2.45	.79	.78	4

\*Ratings were made on a five point scale of extent required for successful job performance (0=Little or no skill/ability required; 2=Moderately high skill/ability required; 4=Very high, advanced skill/ability required).

Individual items were assigned to the factor on which they had the highest loading. The overall mean was simply the average of the ratings for all the items on each factor, averaged over the total sample (N=874, eight cases were deleted due to coding errors).



## Differences Across Organizational Functions and Levels

The analysis of factor scores across organizational functions and hierarchical levels had a twofold purpose: a) to validate the factors by showing that the pattern of factor scores across different functions and levels came out as would be generally expected, and b) to demonstrate how the factor scores could be used to describe the important characteristics of jobs in each different function and level. The latter purpose would be important for linking personnel practices directly to job requirements.

The design for the analysis was a 14 (functions) by four (levels) multivariate analysis of variance (MANOVA) with with the task, knowledge, and ability factors as the dependent variables. The differences in task, knowledge, and ability factor scores were analyzed with three separate MANOVAs, using the SAS General Linear Models (GLM) procedure (SAS, 1982).

The tests for the overall multivariate effects are summarized in Table 14. As expected, the results indicated significant overall differences in task, knowledge, and ability factor scores among jobs in different functions and levels. The differences in task and knowledge factor scores were larger across functions than across levels, as indicated by the larger F values. The differences in individual ability factor scores appeared to be smaller than for the task or knowledge factors, as indicated by the smaller F values. This may have been expected since the individual abilities seemed to have uniformly high

ratings. The interaction effects were not as strong as the main effects.

Since the overall MANOVAs were significant, it was appropriate to examine the univariate ANOVA for each dependent task, knowledge, and ability factor. The results of the univariate ANOVAs are summarized in Table 15. Organizational functions showed significant main effects on all factors except the Results Orientation and Decision Making factors. Hierarchical levels showed significant main effects on all the factors. There were significant function by level interaction effects on only 10 of the 23 factors, and in general, the interaction effects did not appear to be as strong as the main effects.

Student-Newman Keuls tests were computed to examine the patterns of mean factor scores across the different functions and levels. The results for the task, knowledge, and ability factors are presented in Tables 16, 17, and 18, respectively. The pattern of results turned out very much as was generally expected. For example, the sales and marketing function had high ratings on the Sales related task and knowledge factors, the manufacturing function had high ratings on the Engineering and Production task and knowledge factors, electronic data processing had high ratings on the Computer factor, and so forth. The first level entry jobs scored lowest on virtually every factor, and the top level executive jobs scored highest on 20 out of the 23 factors.

The only unexpected result was that the top level jobs and the executive function scored highest on the Managing Others task factor. The review of research on management job analysis clearly indicated

TABLE 14

Summary of MANOVA for Task, Knowledge, and Ability Factors

---

Task Activity Factors

<u>Source</u>	<u>DF</u>	<u>F(a)</u>
Function	104, 4852	22.67**
Level	24, 2039	10.39**
Function x Level	248, 5475	1.98**

Technical Knowledge Factors

<u>Source</u>	<u>DF</u>	<u>F</u>
Function	117, 5260	28.56**
Level	27, 2050	3.37**
Function x Level	279, 6130	1.58**

Individual Ability Factors

<u>Source</u>	<u>DF</u>	<u>F</u>
Function	78, 3893	6.54**
Level	18, 1994	5.83**
Function x Level	186, 4171	1.19*

---

\*p&lt;.05

\*\*p&lt;.0001

(a) Wilk's criterion for no overall effect.

TABLE 15

## Univariate ANOVAs for Task, Knowledge, and Ability Factors

<u>Task Factors</u>	<u>Function</u>	<u>F Values</u>	
		<u>Level</u>	<u>Function x Level</u>
Managing Others	3.22**	8.90**	2.22*
Planning/Decision Making	7.62**	52.85**	1.31
Selling and Marketing	55.52**	20.93**	3.61**
Interacting with Others	2.08*	11.90**	1.09
Engineering/Production	22.39**	5.08*	.77
Research Design/Analysis	11.90**	11.80**	.87
Accounting	17.99**	5.12*	1.16
Legal Affairs	15.60**	25.87**	1.60*
<u>Knowledge Factors</u>			
Biochemistry/Medical	36.81**	3.84*	1.34
Engineering	24.74**	6.21*	1.67*
Sales and Marketing	36.96**	8.92**	2.10*
Finance/General Mgt.	18.63**	22.94**	1.50*
Personnel	12.52**	10.66**	.90
Distribution	29.73**	7.65**	1.56*
Production/Mfg.	30.69**	6.63*	1.34
Computers	10.22**	4.10*	1.84*
Program Evaluation	3.51**	6.22*	1.23

(Continued on following page)

(Table 15 continued)

Ability Factors

Impact/Influence	3.36**	4.16*	.98
Lead Others	2.32*	13.88**	1.83*
Work Style	2.72*	8.33**	1.04
Results Orientation	.66	5.83*	.91
Public Speaking	18.95**	21.29**	1.71*
Decision Making	1.58	10.07**	1.02

---

\*p&lt;.05

\*\*p&lt;.0001

Df: Total=757, Functions=13, Levels=3, Function x Level=31; Error=710.

that direct supervision of employees becomes less important on upper level jobs. The pattern of results presented in this study indicated that upper level managers and executives were highly involved in Managing Others, and more so than people in lower level jobs. This finding seems quite contradictory to previous research. Another somewhat contradictory finding, was that top level executives came out very high in relation to other levels and functions on technical knowledge requirements. Previous research would lead one to believe that technical knowledge is not important at high levels of management. No evidence was found to support that contention in this study.

The important differences in factor scores are more easily observed and interpreted when presented in graphic form. Graphic profiles were created to compare the mean factor scores for each level and function to the overall means for the total sample (cf., King & Boehm, 1981). Raw scores were converted to standardized T-scores, with a mean of 50 and standard deviation of 10, to make the profiles easier to read. The formula to compute a T-score is:

$$T = \frac{\bar{x} - M}{SD} (10) + 50$$

where  $\bar{x}$  is the mean on a factor for an individual level or function, and M and SD are the mean and standard deviation for the total sample (see Anastasi, 1982, p. 79). The T-scores show how far the mean for each group of jobs is above or below the overall mean for the total sample. The profiles for the four hierarchical levels are shown in

TABLE 16

Mean Ratings on Task Factors by Functions and Levels

<u>Functional Area</u>	<u>MG*</u>	<u>PL</u>	<u>SA</u>	<u>IN</u>	<u>EN</u>	<u>RE</u>	<u>AC</u>	<u>LE</u>
Admin./Staff Support	2.4	1.7	.7	2.6	<u>2.0</u>	1.4	1.2	1.0
Bus. Planning & Dev.	1.7	2.0	1.5	2.7	1.1	2.3	1.0	.9
EDP	1.7	1.0	.5	2.4	1.0	1.6	.7	.3
Ops./Distrib.	2.8	1.8	1.2	2.5	1.4	1.3	1.5	.9
Finance	2.1	1.7	.6	2.4	.8	1.5	<u>2.1</u>	.8
Matls. Srv./Prchsg.	2.3	1.6	.9	2.4	1.5	1.3	1.5	.8
Legal Affairs	1.7	.7	.6	2.3	.6	1.0	.6	<u>1.7</u>
Sales/Marketing	2.1	1.7	2.2	2.5	1.0	1.5	1.0	.7
Personnel	2.4	1.4	.8	2.7	.8	1.4	.8	1.2
RA/QA/QC	2.5	1.6	.7	2.7	1.8	2.0	1.1	1.6
R&D	1.7	1.3	.8	2.4	1.7	<u>2.3</u>	.8	.8
Manufacturing	2.3	1.7	.8	2.5	1.9	1.6	1.3	.8
Public Affairs	2.0	1.6	1.3	<u>3.1</u>	.7	1.7	.7	1.5
Executive	<u>3.0</u>	<u>3.4</u>	<u>2.5</u>	3.0	1.5	2.0	1.6	1.3
<u>Level</u>								
Supervisory/Entry	2.0	1.2	.7	2.3	1.3	1.4	1.1	.7
Beginning Mgt.	2.4	1.8	1.1	2.7	<u>1.6</u>	1.8	1.3	1.0
Middle Mgt.	2.4	2.0	1.6	2.7	1.4	1.9	1.3	1.1
Executive	<u>2.6</u>	<u>2.6</u>	<u>1.8</u>	<u>2.9</u>	1.4	<u>1.9</u>	<u>1.3</u>	<u>1.3</u>

\*MG=Managing; PL=Planning; SA=Sales; IN=Interacting; EN=Eng./Prod; RE=Research; AC=Accounting; LE=Legal. (0=Not required; 4=Critical Importance). The highest mean for each factor is underlined.

TABLE 17

Mean Ratings on Knowledge Factors by Functions and Levels

<u>Functions</u>	<u>BI*</u>	<u>EN</u>	<u>SA</u>	<u>FI</u>	<u>PR</u>	<u>DI</u>	<u>PD</u>	<u>CO</u>	<u>PE</u>
Admin./Stf. Sup.	.6	<u>1.3</u>	.5	1.1	.9	1.1	1.1	1.2	1.5
Bus. Plg. & Dev.	1.0	.6	2.0	2.3	1.2	1.3	1.2	1.4	2.5
EDP	.2	.1	.4	1.0	.7	1.0	.6	<u>2.6</u>	1.6
Ops./Distrib.	.6	.4	1.1	1.6	1.2	<u>2.3</u>	1.2	1.0	1.6
Finance	.4	.2	.6	2.2	.9	1.1	.9	1.0	1.2
Matls./Prchsg.	.5	.4	.8	1.5	.8	2.0	1.7	.8	1.3
Legal Affairs	.2	.0	.2	1.1	.8	.3	.3	.8	.2
Sales/Mktg.	.9	.4	2.1	1.4	1.1	1.4	.8	.7	1.8
Personnel	.3	.3	.8	1.2	2.0	.7	.5	.5	2.1
RA/QA/QC	<u>1.8</u>	1.0	.7	1.1	1.1	1.2	2.0	1.0	1.7
R&D	1.8	1.2	.8	.8	.9	.8	1.2	1.2	1.7
Mfg.	.9	1.2	1.0	1.4	1.1	1.6	<u>2.5</u>	.9	1.7
Publ. Affairs	.3	.4	1.2	1.2	1.2	.3	.2	.2	<u>2.7</u>
Executive	1.1	.7	<u>2.6</u>	<u>2.6</u>	<u>2.0</u>	2.1	2.1	1.4	2.2
<u>Level</u>									
Supv./Entry	.8	.6	.7	1.1	.9	1.2	1.2	1.0	1.4
Beginning Mgt.	1.0	<u>.9</u>	1.2	1.6	1.3	1.5	1.4	<u>1.3</u>	2.0
Middle Mgt.	1.0	.7	1.5	1.6	1.2	1.4	1.2	1.0	1.9
Executive	<u>1.1</u>	.7	<u>1.7</u>	<u>1.9</u>	<u>1.5</u>	<u>1.6</u>	<u>1.5</u>	1.0	<u>2.2</u>

\*BI=Bio/Medical; EN=Engineering; SA=Sales; FI=Finance; PR=Personnel; DI=Distribution; PD=Production; CO=Computers; PE=Program Evaluation; (0=Not Required; 2=A Definite Asset; 4=Advanced Knowledge a Must). The highest mean for each factor is underlined.



TABLE 18

Mean Ratings on Ability Factors by Functions and Levels

<u>Functional Area</u>	<u>IMP*</u>	<u>LEAD</u>	<u>STYLE</u>	<u>RESULTS</u>	<u>PUBL</u>	<u>DECIDE</u>
Admin./Staff Support	3.0	2.7	2.9	3.1	1.2	2.7
Bus. Planning & Dev.	3.1	2.1	3.0	3.2	2.3	2.4
EDP	2.7	2.2	2.8	3.0	1.0	2.3
Ops./Distrib.	3.0	2.9	2.6	3.0	1.6	2.5
Finance	2.7	2.3	2.7	3.0	.9	2.2
Matls. Srvc./Prchsg.	2.9	2.4	2.4	2.9	.7	2.5
Legal Affairs	2.9	2.3	2.8	2.8	.9	2.5
Sales/Marketing	3.1	2.5	2.7	3.0	2.5	2.5
Personnel	3.3	2.5	2.7	3.1	2.0	2.6
RA/QA/QC	2.8	2.7	2.9	2.9	1.1	2.6
R&D	2.6	2.0	3.0	2.9	1.3	2.2
Manufacturing	2.8	2.6	2.7	3.0	1.1	2.4
Public Affairs	3.2	2.2	3.2	3.2	2.2	2.7
Executive	<u>3.6</u>	<u>3.5</u>	<u>3.3</u>	<u>3.5</u>	<u>3.5</u>	<u>2.9</u>
<u>Level</u>						
Supervisory/Entry	2.7	2.2	2.6	2.8	1.1	2.2
Beginning Mgt.	3.0	2.7	2.9	3.1	1.8	2.6
Middle Mgt.	3.1	2.8	3.0	3.1	2.1	2.7
Executive	<u>3.3</u>	<u>3.0</u>	<u>3.1</u>	<u>3.3</u>	<u>2.3</u>	<u>2.9</u>

\*IMP=Impact/Influence; LEAD=Lead Others; STYLE=Work Style; RESULTS=Results Orientation; PUBL=Public Speaking; DECIDE=Decision Making; (Amount Required: 1=Little or None; 4=Very High, Advanced).  
The highest mean for each factor is underlined.

Figures 4 through 7. The solid dark line through the center of the profile represents the overall mean for the total sample. Scores below the line represent scores below the overall mean, and scores above the line indicate scores above the overall mean.

### Profiles for Hierarchical Levels

As can be seen in Figure 4, entry level jobs were below the overall mean on almost every factor. The factors they were at the mean on dealt with either Engineering/Production activities or Production/Manufacturing and Computer knowledge.

As shown in Figure 5, beginning management jobs were characterized by a marked increase in most all factors as compared to entry level jobs. This was consistent with Thornton and Byham (1982) who concluded that the biggest change in management was from entry or supervisory positions into beginning management. The high points for beginning management were on Managing Others and Engineering/Production activities, Engineering knowledge, and Leadership ability. They were also fairly high on Planning, Interacting, and Research activities, and Finance, Personnel, Computer, and Program Evaluation knowledge. They were relatively low on Sales activities and Sales knowledge.

Compared to beginning management jobs, middle management jobs (see Figure 6) were higher on Sales activities and Sales knowledge, and lower on Engineering/Production activities and Engineering knowledge. Middle management jobs were also slightly higher on Planning activities, and quite a bit higher on Public Speaking ability. Middle level

Standard Importance Ratings

Overall Mean



TASKS

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

KNOWLEDGE

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

ABILITIES

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -



Figure 4: Task, Knowledge, and Ability Profile for Entry Level Jobs

Standard Importance Ratings

Overall Mean



TASKS

Managing -

Planning -

Selling -

Interact -

Eng/Prod -

Research -

Accountg -

Legal Af -

KNOWLEDGE

Biomed -

Engineer -

Sales -

Finance -

Personnl -

Distrib -

Prod/Mfg -

Computer -

Prg Eval -

ABILITIES

Impact -

Lead Oth -

Style -

Results -

Publ Spk -

Dec Mkg -

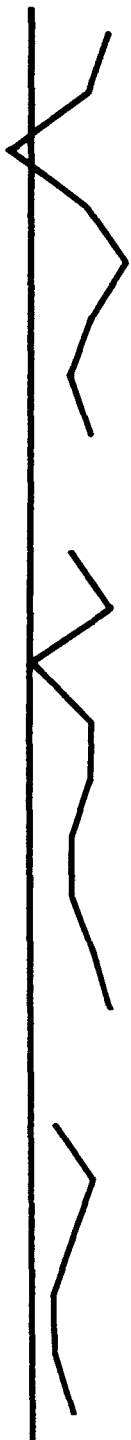


Figure 5: Task, Knowledge, and Ability Profile for Second Level Jobs

Standard Importance Ratings

Overall Mean



**TASKS**

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

**KNOWLEDGE**

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

**ABILITIES**

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -



Figure 6: Task, Knowledge, and Ability Profile for Middle Level Jobs

Standard Importance Ratings  
Overall Mean



**TASKS**

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

**KNOWLEDGE**

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

**ABILITIES**

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

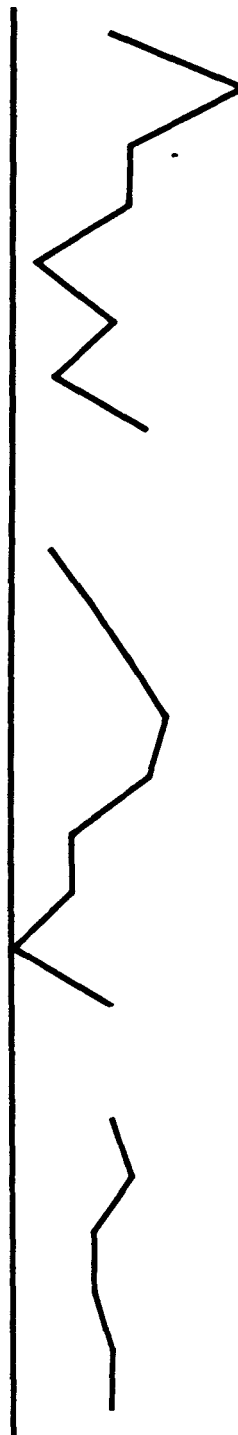


Figure 7: Task, Knowledge, and Ability Profile for Top Level Jobs

management jobs were slightly lower on Distribution, Production/Manufacturing, and Computer knowledge. It appeared that middle management jobs were oriented toward Planning/Decision Making and Sales activities, whereas beginning level management jobs were oriented toward Production activities and knowledge. On other factors, such as Managing, Interacting, and Research activities, and Personnel, Finance, and Program Evaluation knowledge, beginning and middle management jobs were very similar.

As shown in Figure 7, the outstanding characteristic of top executive jobs was the spike on Planning/Decision Making activities. Executive jobs were also characterized by large increases, compared to middle management, on Legal activities, and Finance/General Management and Personnel knowledge.

As noted previously, compared to all lower level jobs, executive level jobs were highest on every factor except Engineering/Production activities and Computer knowledge. Thus, executive jobs were also higher on Managing Others, Selling and Marketing, and Interacting with Others activities.

In terms of Engineering, Distribution, and Production/Manufacturing knowledge, the top level jobs resembled beginning management jobs more than they did middle management. They were even slightly higher than beginning management on Distribution and Production knowledge. Thus, even though top level executives may not be directly involved to a great extent in Production activities, they must have a great deal of technical knowledge about these aspects of the organization.

Top executive jobs were also high on Program Evaluation knowledge. It may be that top executives must have enough technical knowledge of manufacturing, production and engineering practices to evaluate how operations are going and to make major decisions that affect production and operations.

In terms of abilities, executives were slightly higher on all abilities compared to middle management. The biggest increases were on Impact, Leadership, Results Orientation, and Decision Making.

The results showed that top executives were clearly generalists, but they were very involved in a wide variety of activities, and were very knowledgeable of nearly all technical aspects of the organization. They had very high personal abilities. The top level jobs were highlighted by Planning/Decision Making/Controlling activities, and Financial, Personnel, and Sales and Marketing knowledge.

The way the top executives described what they thought was important on their jobs was consistent with the recent book In Search of Excellence, by Peters and Waterman (1982). Peters and Waterman found that excellent companies showed strong action orientations and stayed close to the customer. The high scores for the top executives on Results Orientation and Sales and Marketing activities and knowledge could be interpreted as confirmation of Peters' and Waterman's findings. Even stronger confirmation is shown in the next section in reference to the executive function, which includes only the very top ten executives in the sample.



When averaged over all the management/professional jobs in each hierarchical level, no level was very high on Accounting activities or Biomedical knowledge. These factors were apparently related to specific functions of the organization, as can be seen in the next section.

### Organizational Function Profiles

The profiles for the different functional areas of the organization are presented in Figures 8 through 21. These profiles help to establish the validity of factors by showing that they discriminate among the functional areas as would generally be expected. They also describe the important characteristics of each function, which can be very useful for establishing the link between personnel practices and job requirements.

The administration/staff support function was responsible for the maintenance of company equipment and facilities. The profile in Figure 8 showed that the focus of the function was on Engineering/Production activities and Engineering knowledge. Jobs in this function were also slightly high on Managing Others and Legal Affairs activities. This function involved very little contact with people outside the organization as indicated by low ratings on Sales activities, Sales knowledge, and Public Speaking ability. Since the function was low on Production/Manufacturing knowledge, it appeared that jobs in this function supported rather than directly participated in the production process. The focus of the function was on Engineering, and the moderately high

Standard Importance Ratings  
Overall Mean



**TASKS**

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

**KNOWLEDGE**

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

**ABILITIES**

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

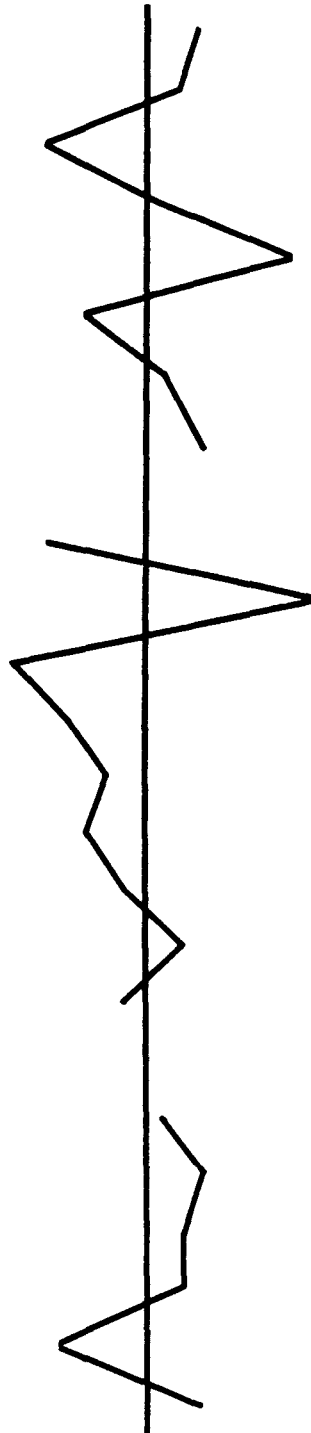


Figure 8: Profile for Administration/Staff Support Function

Standard Importance Ratings

Overall Mean



TASKS

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

KNOWLEDGE

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

ABILITIES

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

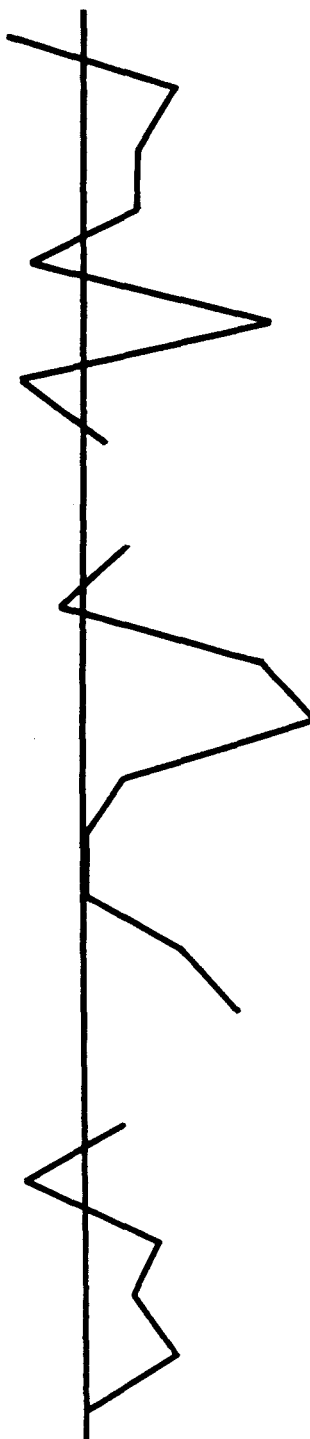


Figure 9: Profile for Business Planning and Development Function

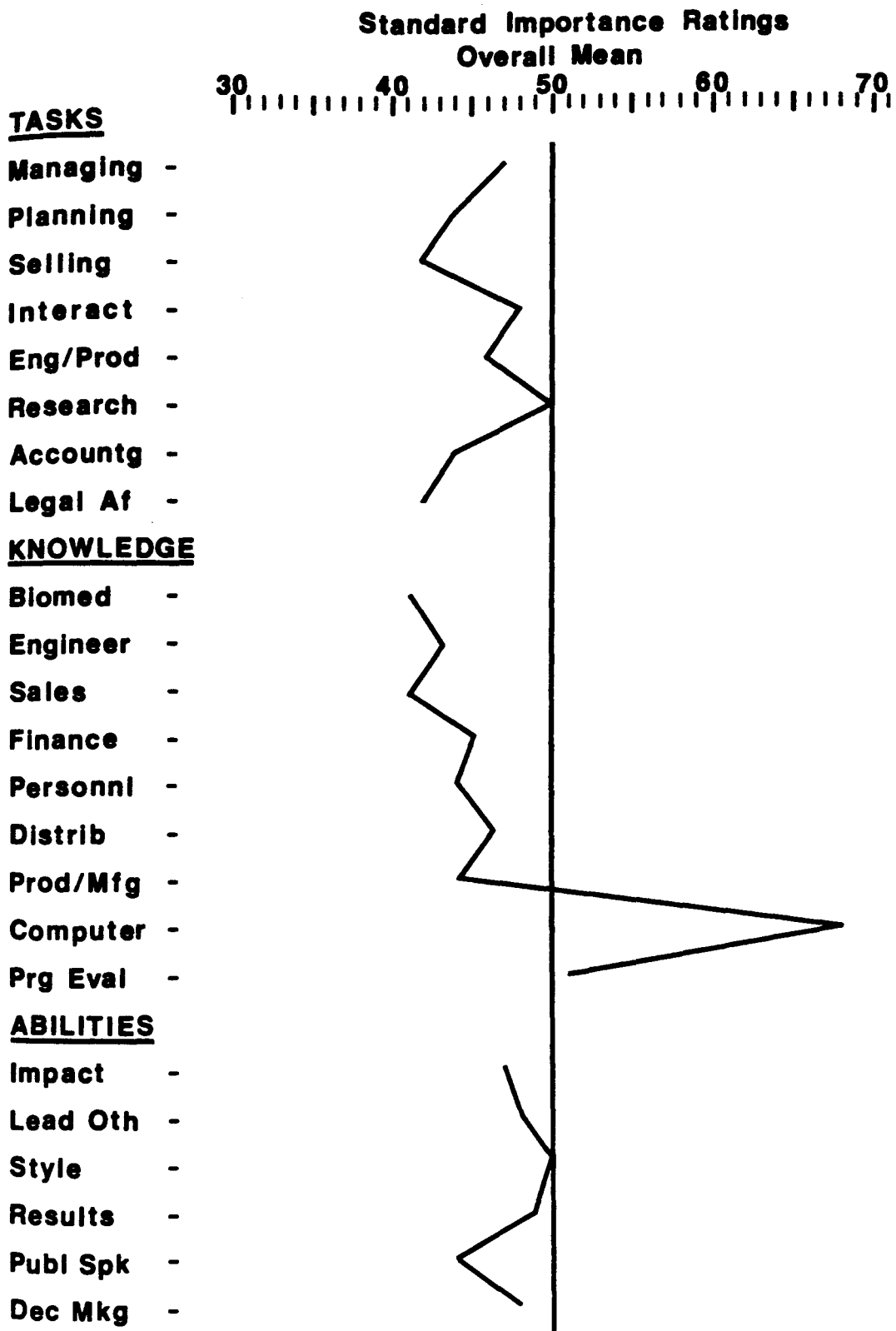


Figure 10: Profile for Electronic Data Processing (EDP) Function

Standard Importance Ratings

Overall Mean



TASKS

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

KNOWLEDGE

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

ABILITIES

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

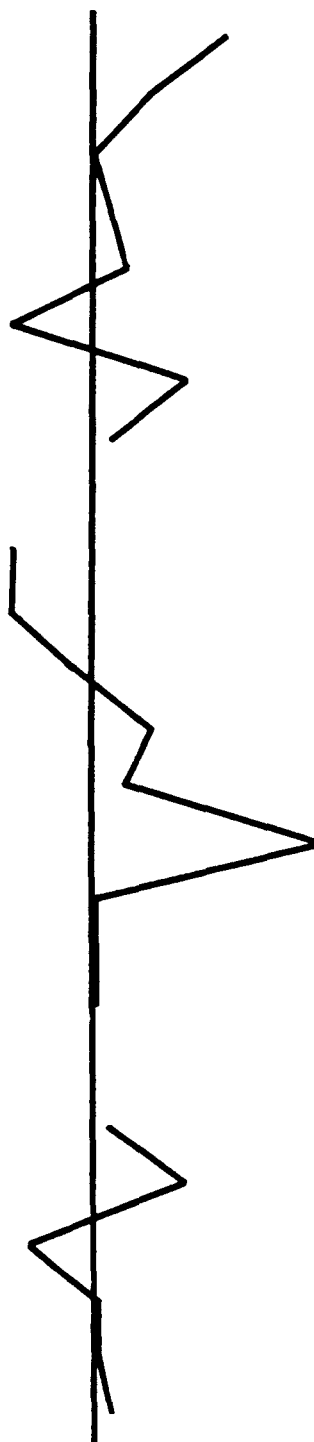


Figure 11: Profile for Operations/Distribution Function

Standard Importance Ratings  
Overall Mean



TASKS

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

KNOWLEDGE

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

ABILITIES

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

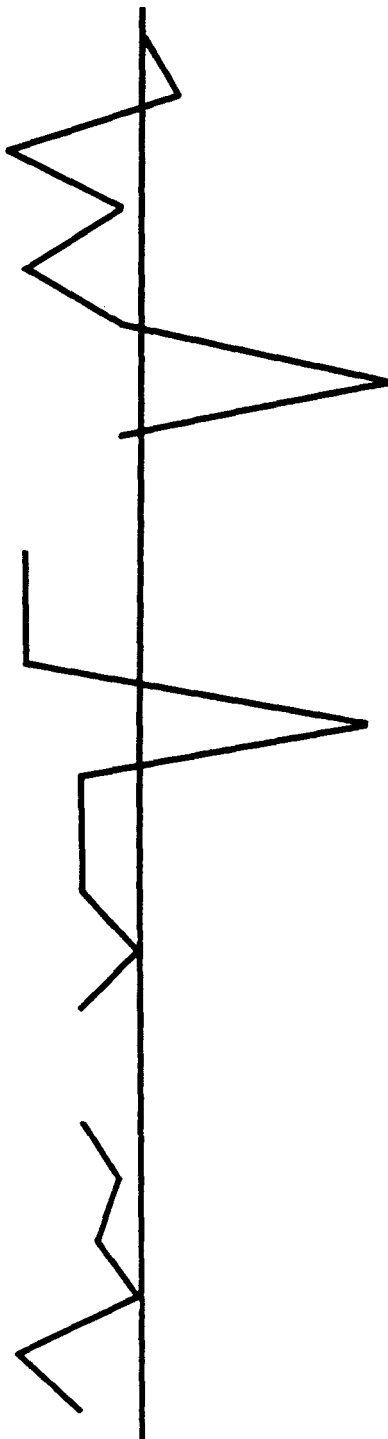


Figure 12: Profile for Finance Function

Standard Importance Ratings  
Overall Mean



TASKS

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

KNOWLEDGE

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

ABILITIES

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

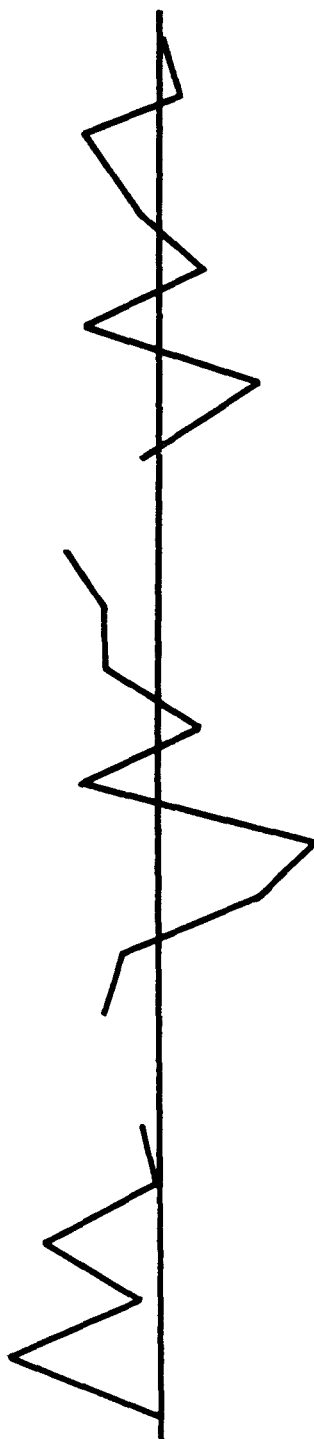


Figure 13: Profile for Materials/Service/Purchasing Function

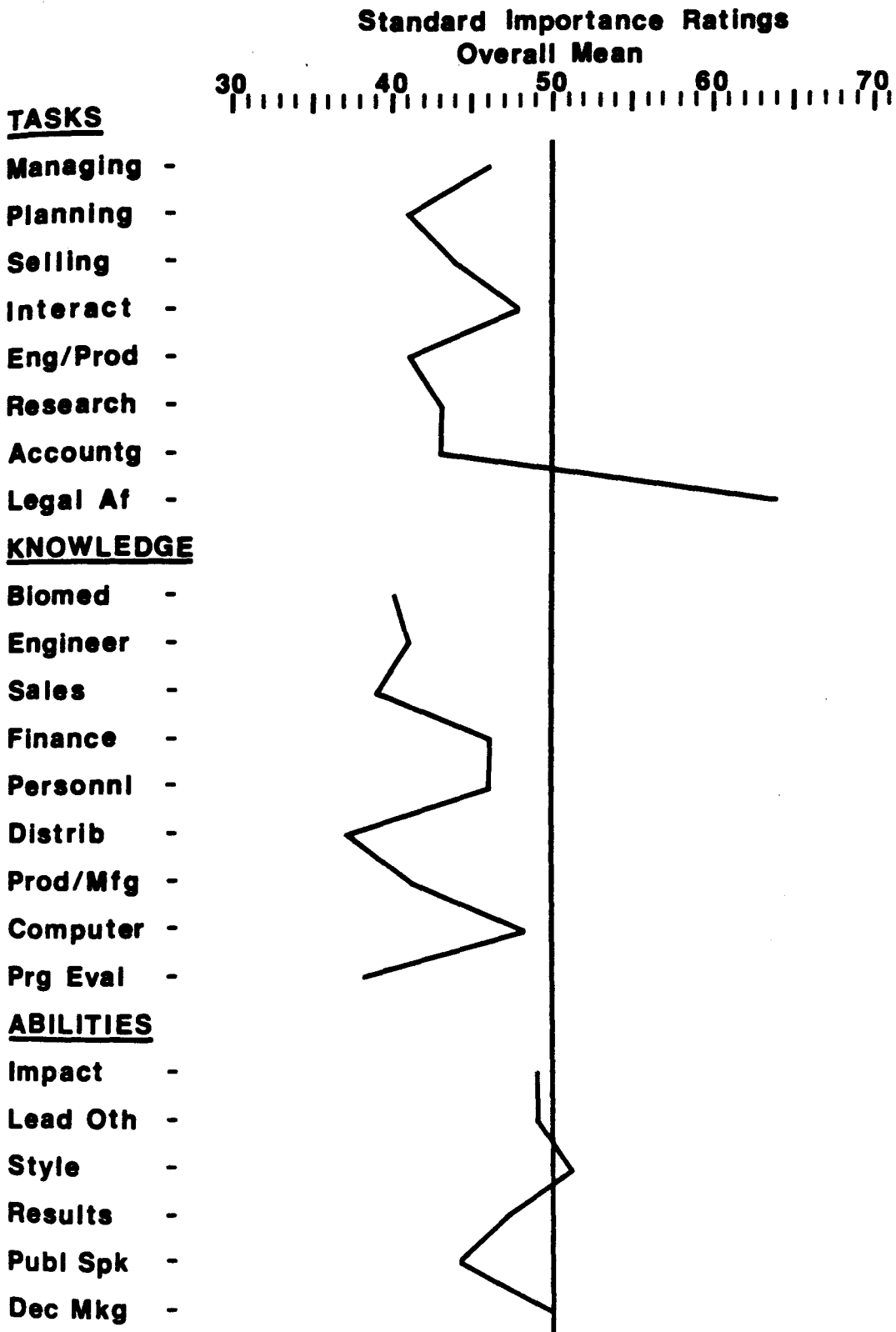


Figure 14: Profile for Legal Affairs Function



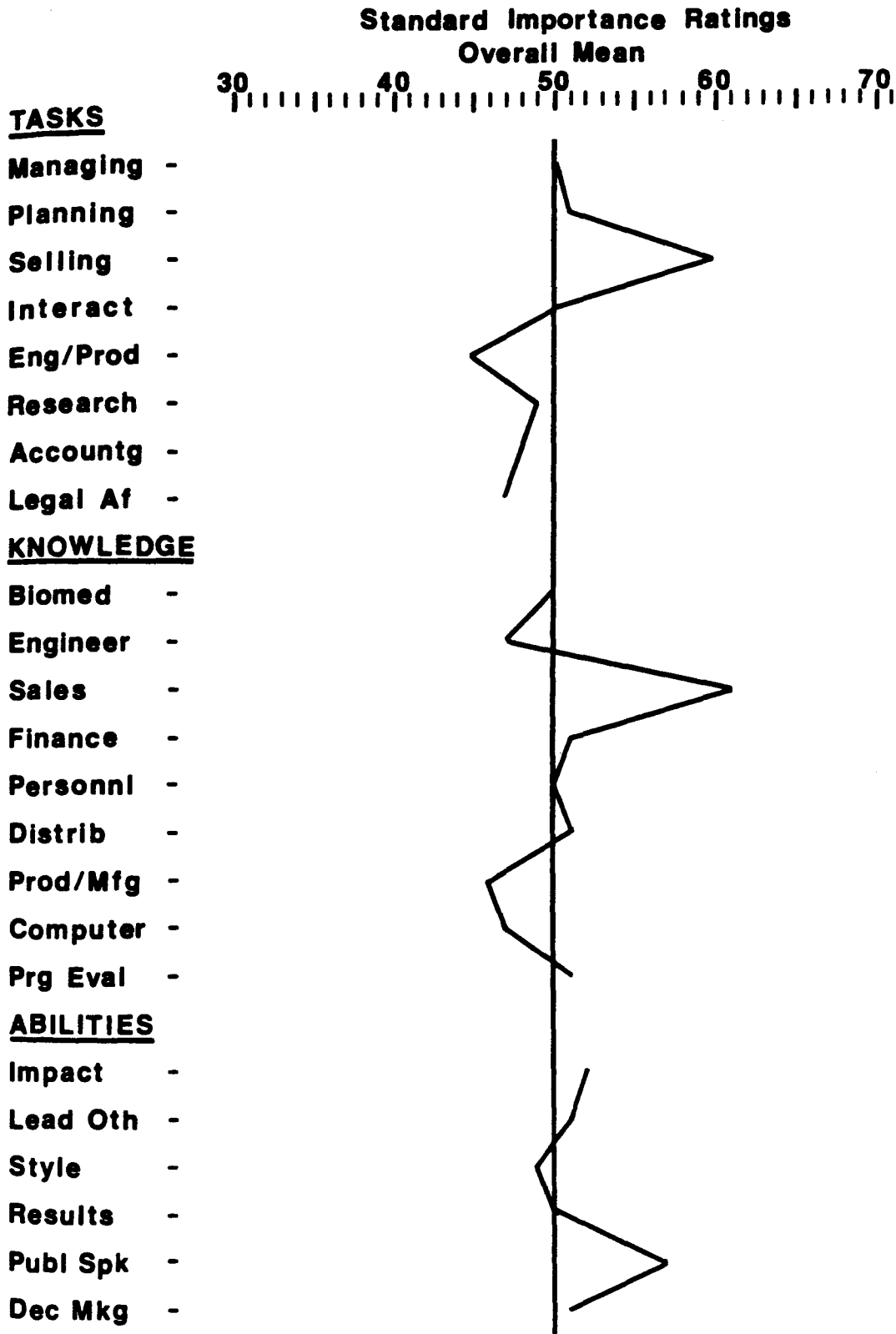


Figure 15: Profile for Sales/Marketing Function

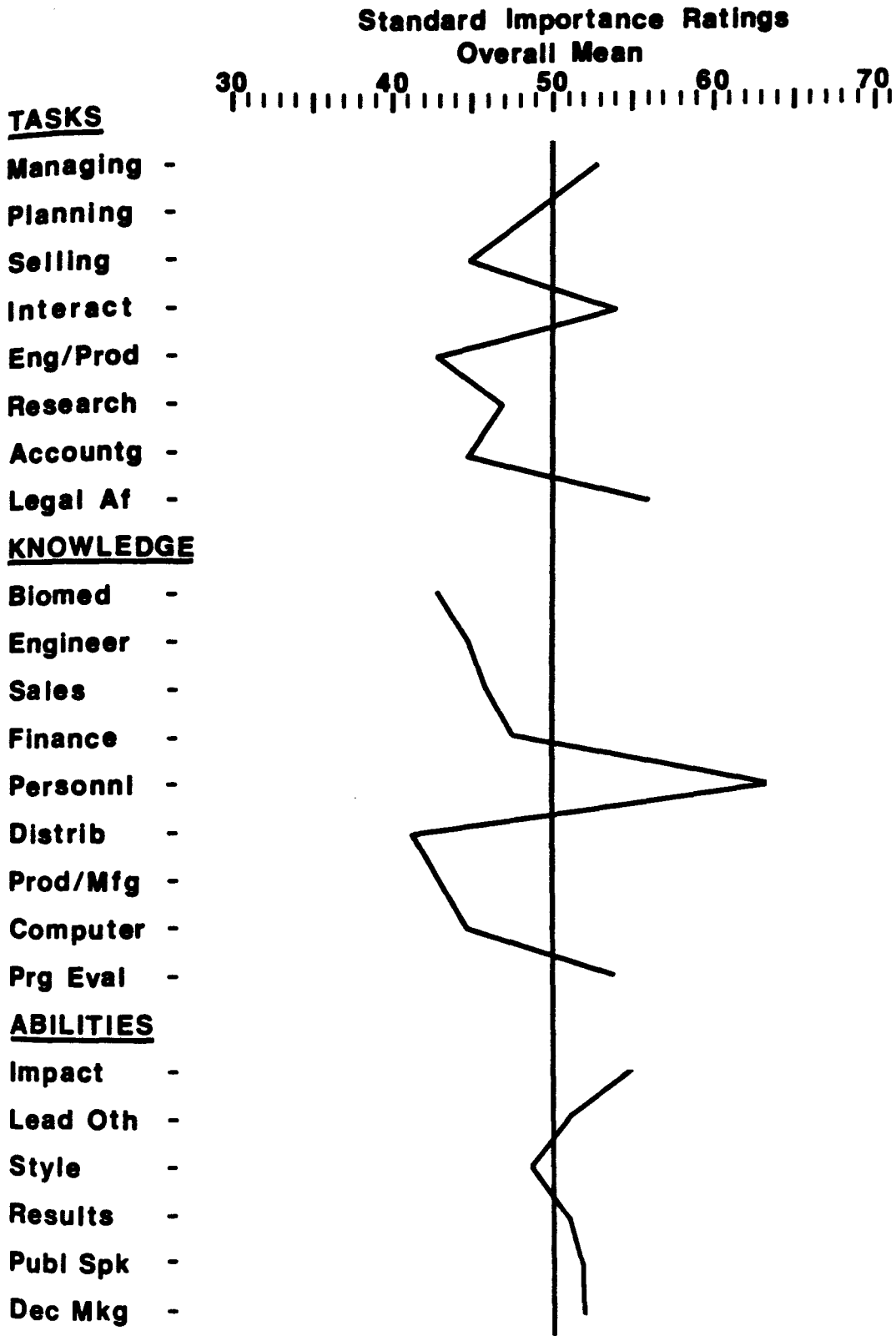


Figure 16: Profile for Personnel Function

Standard Importance Ratings  
Overall Mean



TASKS

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

KNOWLEDGE

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

ABILITIES

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

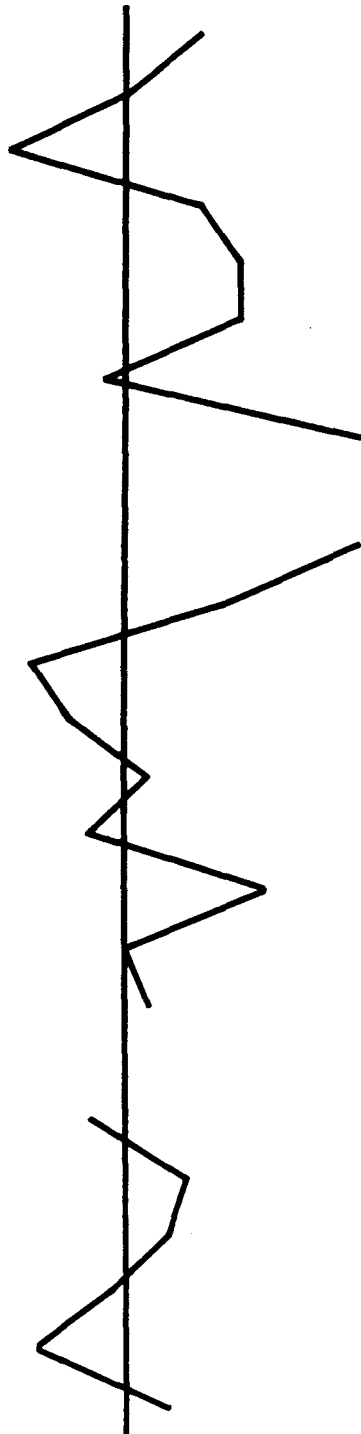


Figure 17: Profile for Regulatory Affairs (RA/QA/QC) Function

Standard Importance Ratings

Overall Mean



TASKS

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

KNOWLEDGE

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

ABILITIES

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

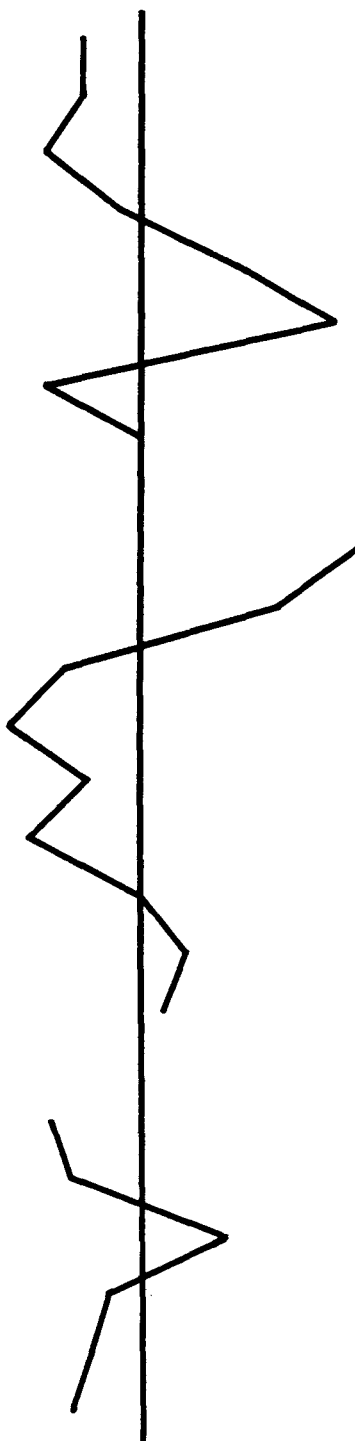


Figure 18: Profile for Research and Development Function

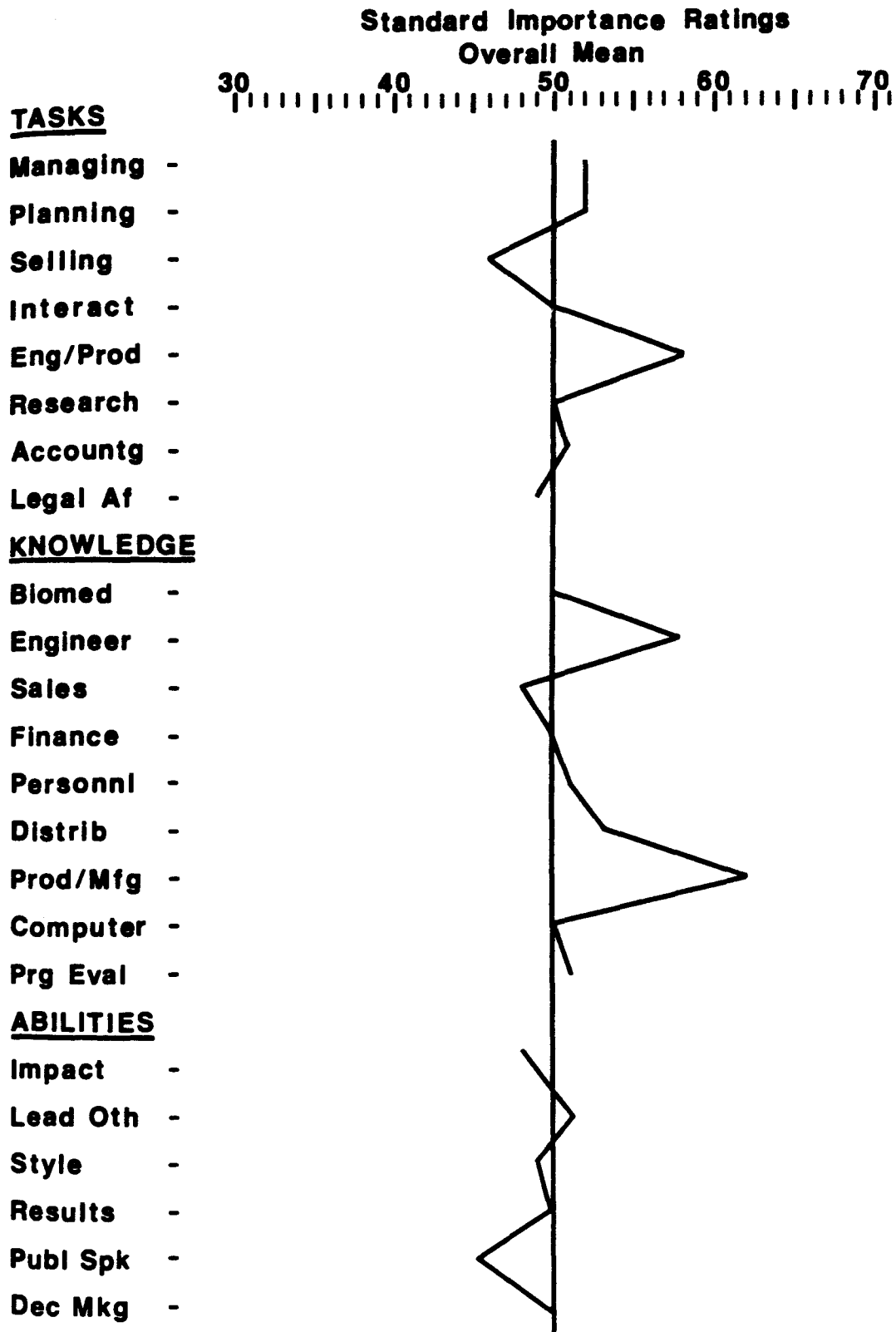


Figure 19: Profile for Manufacturing Function

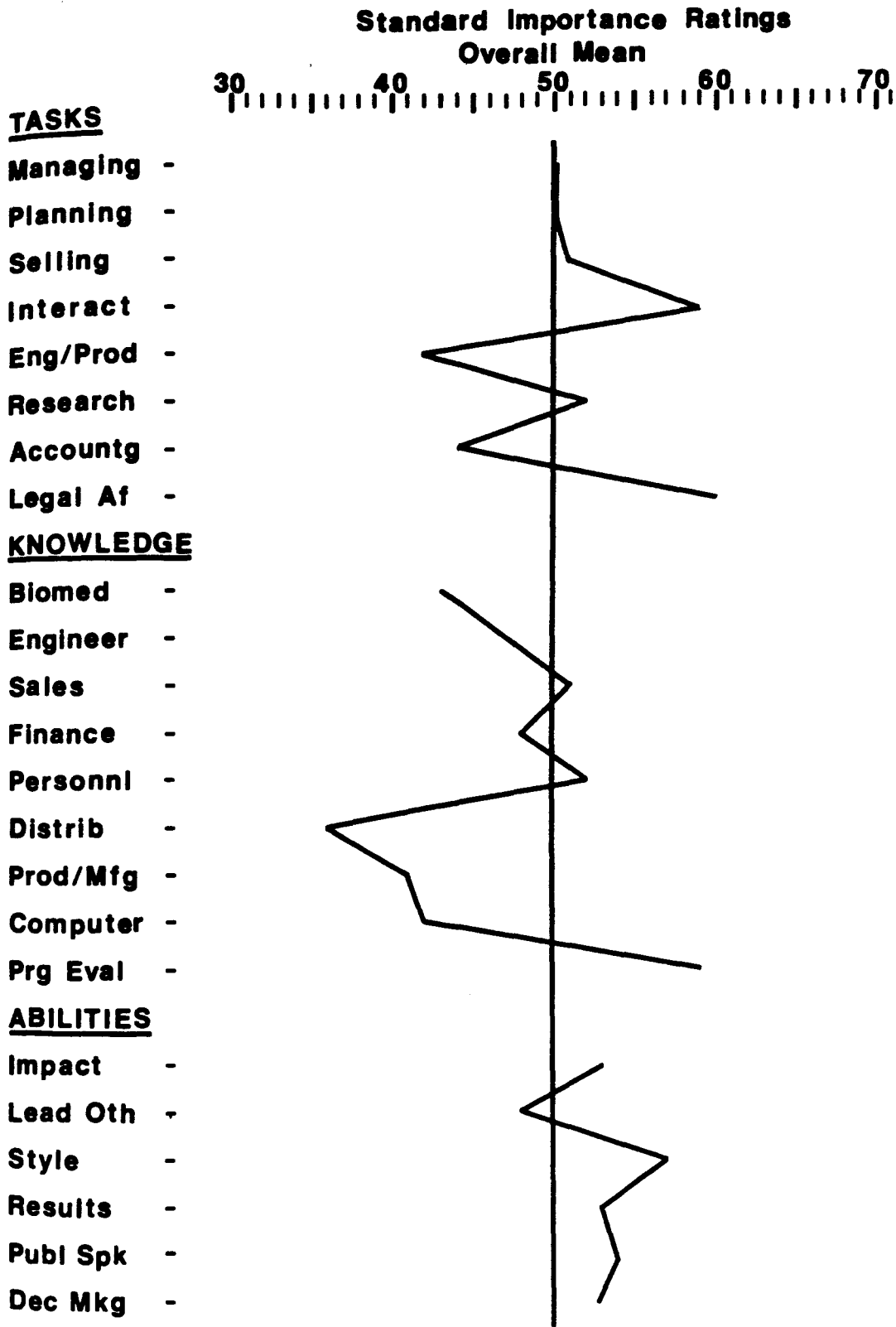


Figure 20: Profile for Public Affairs Function

**Standard Importance Ratings**  
Overall Mean

30 40 50 60 70

**TASKS**

- Managing -
- Planning -
- Selling -
- Interact -
- Eng/Prod -
- Research -
- Accountg -
- Legal Af -

**KNOWLEDGE**

- Biomed -
- Engineer -
- Sales -
- Finance -
- Personnl -
- Distrib -
- Prod/Mfg -
- Computer -
- Prg Eval -

**ABILITIES**

- Impact -
- Lead Oth -
- Style -
- Results -
- Publ Spk -
- Dec Mkg -

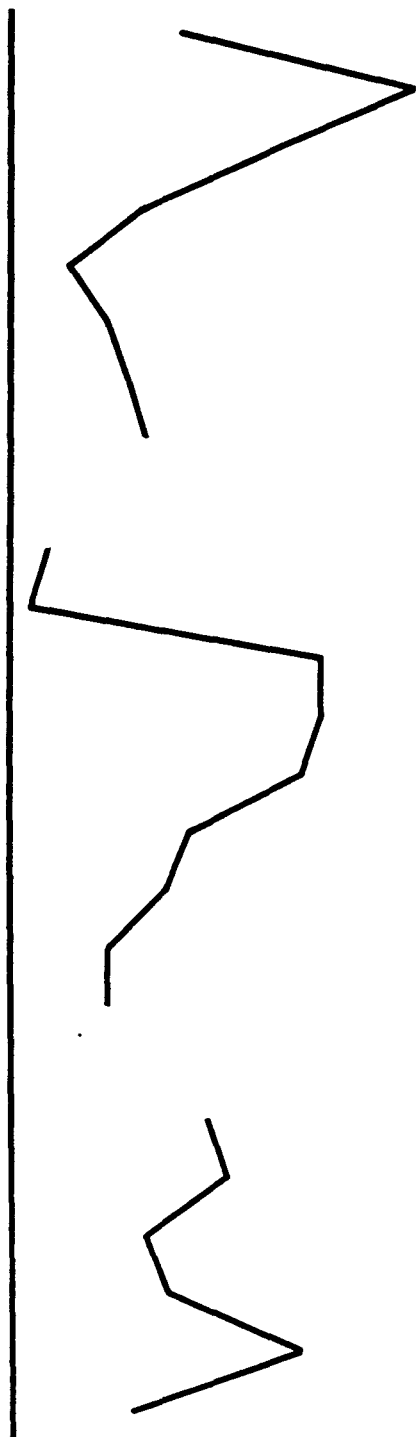


Figure 21: Profile for Executive Function

score on Legal Affairs suggested people in these jobs set and approved standard specifications for manufactured goods in order to meet legal guidelines.

The business planning and development profile in Figure 9 showed a fairly complex function involved in many activities and which required knowledge and abilities in many areas. The profile showed peaks on Research and Planning activities, and on Financial/General Management and Sales knowledge. The higher score on Sales knowledge compared to Sales activities suggested that the function was more involved in Sales planning than direct Selling activities. The function also showed high scores on Computer and Program Evaluation knowledge. The profile showed peaks on Public Speaking and Work Style abilities. Interestingly, this function was low on Leadership and Decision Making abilities and Managing Others activities. It appeared that the focus of this function was on Planning the introduction of new products or systems into the mainstream Sales and Marketing functions of the organization. It involved writing reports and making recommendations in Public presentations, but it did not involve final Decision Making authority over implementation of these new products or services. The focus of the function was to enhance the efficiency and financial position of the organization.

The electronic data processing (EDP) function profile shown in Figure 10 was definitely a specialty function involved almost exclusively with Computer hardware and software. The profile showed a spike on Computer knowledge and low scores on almost everything else. Com-



pared to its own profile, it showed relatively high scores on Research activities and Work Style abilities.

The operations/distribution function profile in Figure 11 showed very high peaks on Managing Others activities and Distribution knowledge, as would be expected for the distribution function. It also showed a peak on the Lead Others ability factor, corresponding to the Managing Others activities. The slight peaks on Accounting activities and Financial knowledge indicated the importance of keeping accurate records and maintaining efficiency in this function. The fairly high rating on Personnel indicated that management in this function should have some knowledge of Personnel matters. Overall, the emphasis of management in this function appeared to be on keeping fairly tight controls and maintaining efficiency of the distribution process.

The finance function profile shown in Figure 12 indicated that finance was another specialty function similar to EDP. It showed peaks on Accounting activities and Financial knowledge. It involved very little interaction with others as indicated by low scores on Interacting activities and all the individual abilities factors. The slightly high score on Planning activities was probably due to the financial aspects of Planning such as budget preparation and internal business controls.

The materials service/purchasing function profile in Figure 13 showed peaks on Accounting, and Engineering/Production activities, and on Distribution and Production/Manufacturing knowledge. This profile was similar to the one for the distribution function except the distri-

bution function involved much more Managing and Planning activities, and Personnel knowledge. The materials function was primarily involved in supplying and accounting for materials used in the production process.

The legal affairs function profile in Figure 14 showed a spike on Legal Affairs activities and low scores on most all the other factors. It showed a slightly high rating on Work Style ability which indicated some involvement in writing and communicating technical materials. Legal affairs was clearly another specialty oriented function.

The sales and marketing function profile in Figure 15 showed high peaks on Selling activities and Sales knowledge, as would be expected. It also showed a peak on Public Speaking ability corresponding to the Sales activities. The profile also showed a fairly high amount of Impact/Influence ability which would be expected for sales positions. This function also showed slightly high amounts Planning activities, Finance, Distribution, and Program Evaluation knowledge, and Decision Making ability.

The personnel function profile in Figure 16 showed a peak on Personnel knowledge as would be expected. It also showed quite high scores on Managing Others, Interacting with Others, and Legal Affairs activities, and Program Evaluation knowledge. The ability profile showed quite a high peak on Impact/Influence ability, and moderately high scores on the other abilities except for Work Style. The profile showed low importance scores on Production, Research, and Sales activities and knowledge. Overall, the personnel function appeared to

involve a great deal of interaction and communication with others to meet the personnel related needs of the organization.

The regulatory affairs (RA/QA/QC) function profile in Figure 17 showed high peaks on Legal Affairs activities and Bio-medical knowledge. This indicated that the medical specialties area of the organization was heavily regulated. The profile also showed quite high scores on Research, Engineering/Production, Interacting with Others, and Managing Others activities, and on Engineering and Production/Manufacturing knowledge. The jobs in this function required quite high Leadership, Work Style, and Decision Making abilities, but they did not require Public Speaking ability. It appeared that jobs in the regulatory affairs function worked closely with people in Research and Production, but they were not involved in Sales and Marketing aspects of the organization.

The research and development profile in Figure 18 showed a peak on Research activities as would be expected. The peak on Bio-medical knowledge indicated the focus of this function was on medical specialty products. Jobs in this function required Engineering knowledge and worked closely on Engineering/Production activities as indicated by the high scores on these factors. Apparently, incumbents in the research and development function must keep in mind how new products will fit into the production process. The high rating on Work Style ability indicated the importance of effectively communicating technical material to others for successful performance in this function.

The manufacturing function profile in Figure 19 showed peaks on Engineering/Production activities, and on Engineering and Production/Manufacturing knowledge, as would be expected. It also showed fairly high amounts of Managing Others and Planning/Decision Making activities, and Distribution knowledge, which would be expected since manufacturing must interface with distribution. Overall, the focus of the function was on the production process and it involved a fairly high amount of Managing activities.

The public affairs profile in Figure 20 showed high peaks on Interacting with Others and Legal Affairs activities, and on Program Evaluation knowledge. It appeared that public affairs jobs involved a great deal of Interaction with government and legal representatives over matters of government regulations and programs that affected the company. The profile was high on all individual abilities except Leadership, as would be expected for public affairs jobs.

The executive function profile in Figure 21 showed a very high profile on almost all the task, knowledge, and ability factors. The highlights of the profile were on Planning activities, Sales, Finance, and Personnel knowledge, and Impact, Leadership, and Public Speaking abilities. The characteristics were consistent with the top level executive jobs in Figure 7, except the high points were accentuated in the executive function profile. The executive function showed the highest ratings of all functions on Managing, Planning, Selling, and Interacting activities, on Sales and Financial knowledge, and on all the individual ability factors. It was second highest on Accounting

activities, and Personnel, Distribution, Production, and Computer knowledge. There was no indication from this profile that Managing activities or technical knowledge requirements decreased in top level executive jobs as compared to lower level management positions. Instead, top executives reported that they were involved in most major activities of the organization and required extensive technical knowledge in many different areas, especially Sales, Finance, and Personnel. The top executives in this organization were clearly a very unique group of individuals and their positions required high levels of technical knowledge and personal abilities to carry out a wide variety of activities required in their positions.

In summary, the function profiles confirmed the validity of the factors. The profile showed patterns of importance ratings much as would have been predicted. The factors also appeared to be very useful for describing the important characteristics of each function.

## DISCUSSION

### Technical and Process Facets of Management Jobs

One of the most important implications of this study is that management/professional jobs include both technical and process facets. In this study, the process facets included the Managing Others, Interacting with Others, and Planning/Decision Making/Controlling task factors. The focus of these factors was on organizing work, establishing work goals, solving problems, allocating resources, and improving work methods. These activities were all oriented toward insuring expenditure of coordinated effort toward the accomplishment of organizational goals and objectives. The process facets, however, described very little about what the actual goals and objectives of the organization were. The technical facets did that.

The technical facets were the Sales and Marketing, Engineering/Production, Research, Accounting, and Legal Affairs task factors. These factors described in more detail the actual technical content of the work. To some extent, the technical task factors characterized the major goals of the whole organization. The major technical task factors were Sales and Marketing, Engineering/Production, and Research, in that order according to the number of items on each factor. Thus, the process activities were oriented toward planning, managing, and improving the Sales, Production, and Research activities of the organization.

Clearly, both process and technical facets are critical to the effective functioning of an organization. One can just imagine a highly trained management staff, highly skilled in strategic planning, decision making, problem solving, and leadership, but they would be ineffective without trained technical specialists in sales, production, and research. Alternatively, one can imagine a very strong technical staff, very highly trained and knowledgeable in technical specialties of medical research, production engineering, and the latest sales techniques, but they would also be ineffective without management to establish goals, schedule work, provide resources, and the like.

The present findings indicated that most jobs in the organization required incumbents with both process and technical skills. The Interacting with Others process factor showed high importance for virtually all hierarchical levels and functional areas in the organization, and every functional area showed moderately high importance on at least one technical task or knowledge factor (see Tables 16 and 17). Upper level jobs showed high importance on all process task factors and numerous technical task and knowledge factors (see Figures 7 and 21).

Some earlier studies, especially in the 1950's (e.g., Flanagan, 1951; Fleishman, 1953; Williams, 1956), emphasized the process facets almost to the total exclusion of the the more technically oriented facets. One possible reason for the emphasis on process facets in earlier research may have been due to the stage of industrial development at that time. In the 50's, growth was in the smokestack and industrial manufacturing sectors. The technology involved was common to most all

of the industries. Therefore, the major variable of interest was the leadership style or process facets of the job. In the last two decades jobs in our society have become more technical and complex. Now it is more important for managers and professionals to establish specialized areas of technical expertise. Hemphill (1959, 1960) identified some of the technical facets of management jobs, and the emphasis on technical facets was even more distinct in the later work of Gomez-Mejia et al. (1979), and now in the present study. As our society continues to move into more diverse and complex technical stages the description of management and professional jobs will have to continue to include analysis of the technical facets.

The present findings indicated that jobs at all levels were closely linked to technical areas of specialization. Supervisory level jobs appeared to be most specialized. Thus, in order to understand supervisors' complete jobs it was important to know the technical nature of their jobs (e.g., Production, Distribution, Research, Sales, Legal Affairs, Personnel, Computers, etc.) in addition to knowing that they were involved in supervisory activities. Each one of these technical areas was associated with a specialized body of knowledge, which would make it difficult for a supervisor to move from one area to another. Their supervisory skills would transfer across specializations, but their technical knowledge would not. This idea of jobs being linked to specialized areas of technical knowledge is related to the basic division of labor. Jobs must be specialized in order for incumbents to master the technical details of their particular func-



tion. This will be even more important as jobs become more technically complex.

Jobs at upper levels of the organization showed a much broader perspective than at lower levels, but they were also linked to specialized knowledge areas. The key knowledge areas for top level jobs were Personnel, Financial, and Sales (or people, money, and markets). In the other technical areas (e.g., Production, Distribution, Computers, Research, etc.) upper-level positions appeared to require more general than specific knowledge. That is, incumbents had to know of these processes, but they probably did not have to know the specific details of how to perform them.

Thus, it appeared that jobs at all levels were linked to specific areas of technical specialization, and general knowledge of additional areas of the organization were useful but not essential to effective performance. At upper levels, general knowledge of all areas of the organization may be more important. As organizations become larger and more complex, it will be even more important to study the technical knowledge requirements of jobs. The procedures and results from the present study provide a framework for studying the technical aspects of management and professional jobs.

This is not to suggest placing emphasis on the technical facets to the exclusion of process facets, only that the technical facets are more important today than they were 30 years ago. The process facets are still very important, and what has been learned about leadership processes in the past decades is still very applicable today.

## Technical Knowledge and Ability Requirements

The analysis of the technical knowledge and ability requirements of management and professional jobs supplemented and confirmed the analysis of the task activities. Many of the technical knowledge factors showed a fairly direct correspondence to the task activity factors. For example, the Engineering, Distribution, and Production/Manufacturing knowledge factors paralleled the Engineering/Production task factor ( $r = .68, .37, \text{ and } .60$ , respectively). The knowledge factors made it possible to identify some subtle differences between the different groups of jobs involved in Engineering/Production activities (see Figures 8, 11, 13, and 19). The Engineering and Biomedical knowledge factors also corresponded closely to the Research activity task factor ( $r = .41 \text{ and } .52$ , respectively). Thus, Engineering knowledge was important for both Production and Research activities. The Selling and Marketing and Accounting task factors also corresponded closely to the Sales and Finance knowledge factors ( $r = .82 \text{ and } .59$ , respectively). The Finance knowledge factor also corresponded closely to the Planning task factor ( $r = .68$ ). Personnel knowledge corresponded quite closely to Managing and Planning activities ( $r = .52 \text{ and } .53$ , respectively). The Program Evaluation knowledge factor corresponded quite closely to the Planning, Interacting with Others, and Research activities ( $r = .48, .50, \text{ and } .46$ , respectively). Computer knowledge was a unique factor that did not correspond closely to any activity factors per se, probably because the few computer task activity statements were subsumed under broader task factors. Overall,

the knowledge factors tended to confirm and expand the descriptions of the jobs based on the task factors alone.

The individual ability factors also expanded on the task and knowledge factors. They described the jobs in terms of the personal characteristics that were important for job success, and these characteristics would not have been evident from an analysis of the task activities alone. The Impact/Influence and Public Speaking ability factors showed close correspondence to the Sales activity and knowledge factors ( $r = .77$  and  $.70$ , respectively). Also, as noted in the results section, the Interacting with Others task factor correlated highly with the Impact/Influence, Lead Others, Work Style, Results Orientation, and Decision Making ability factors. Thus, the ability factors helped to establish the nature of the Interacting with Others task factors. It appeared that the interactions were focused on Influence, Leadership, Communication, Results, and Decision Making. Furthermore, the ability factors along with the process activity factors (i.e., Managing, Interacting, and Planning) provided a good indication of the extent to which jobs involved working with others and required interpersonal abilities. Low importance on all these factors seemed to indicate that the jobs in question involved very little interpersonal interaction. The Public Speaking and Sales factors provided a good indication of the extent to which jobs involved external contact and speech making.

Overall, the analysis of the knowledge and ability requirements provided information which could not have been inferred from an analysis of the task activities alone. Each type of job information pro-

vided some unique information that helped to provide a fuller and more complete understanding of the jobs under investigation.

From both content and methodological perspectives it was very useful to collect multiple types of job information. Inferences about the jobs could be based on multiple sources rather than just one. For some jobs, it appeared that knowledge was more important than corresponding tasks, which probably indicated that the jobs involved more planning on those aspects than direct involvement. These types of inferences could not have been drawn from analysis of only job activities. In general, stronger inferences can be made when multiple methods of data collection all converge on the same conclusion.

Furthermore, it is useful to conceptualize jobs in term of this trichotomy of tasks, knowledge, and abilities. Each job involves some of each of these types of job information to varying degrees.

### Comparison to Previous Studies

Many factors that emerged from the present study confirmed the results from earlier studies. Planning and Supervision have been consistently identified as important management job activities in previous research, and they emerged as major factors in this study. However, whereas previous researchers (e.g., Gomez-Mejia et al., 1979; Hemphill, 1959, 1960) identified separate factors for Long-range Planning, Controlling, Exercise of Broad Power and Authority, Preservation of Assets, and so forth, these dimensions were all combined into one Planning/Decision Making/ Controlling factor in this study. These activi-

ties all seemed to go together and were characteristic of upper-level jobs. Managers and executives who made long-range plans also had the authority to control financial and other resources and to make final decisions on important matters affecting the company. Combining these activities into one factor made a more parsimonious solution without loss of information.

The Managing Others factor in this study covered direct supervision of work and personnel related activities of selection, training, and explaining company policies. Supervision is usually associated with lower-level jobs, but it was evident that upper-level managers also engaged in these activities. In other words, upper-level managers must plan, schedule, and evaluate the work of their subordinates just as lower-level supervisors do. Therefore, Managing Others was considered a more appropriate name for this factor than Supervision.

Interacting with Others had been identified in a number of previous studies albeit under about as many different names as there were studies, such as Relations with Others (Williams, 1956), Providing a Staff Service in Nonoperational Areas (Hemphill, 1959, 1960), and Coordinating (Gomez-Mejia et al., 1979). The characteristics of managers' jobs that Mintzberg (1971, 1975) described, i.e., a) fast paced, b) characterized by variety, fragmentation, and brevity, c) managers' preference for verbal communication, and d) managers' ability to control their own affairs, also seem to capture the nature of the Interacting with Others factor. Mintzberg's informational roles also seem related to Interacting with Others. The focus of Interacting with Oth-

ers in this study was on the exchange of information, usually to persuade others, to solve problems, or to improve work methods. These contacts appeared to be verbal and often informal. Yet the factor also contained many activities that indicated that it was important to consider interpersonal relations in these contacts, e.g., "encourage openness and cooperation in others," "read people and respond appropriately," and "persuade others to take action or change their point of view." Thus, even though these contacts were often candid and informal in nature, they usually had very significant and specific purposes. The high importance rating for this factor on nearly all jobs indicated that it represented activities of considerable importance and frequency on management and professional jobs. It was a more widespread activity than Managing or Planning and seemed to be at the very core of management and professional jobs. It was also distinct from Managing Others as some jobs were high on Interacting but low on Managing. Interacting with Others seems to be a very significant aspect of management jobs as shown by the results of this study and its emergence in many studies prior to this one.

In terms of more technical aspects of management and professional jobs, the Sales and Marketing and Engineering/Production task factors were also covered in previous studies by Hemphill (1959, 1960) and Gomez-Mejia et al., (1979). Production and Sales activities are probably quite common to numerous organizations. Accounting activities have been identified in some other studies, but under slightly different names and different focus (e.g., Preservation of Assets, Monitoring

Business Indicators, etc.). In this study Accounting dealt with traditional accounting methods (e.g., financial statements, audits, etc.), but it also dealt with more general record keeping (e.g., fill out standardized forms, keep detailed and accurate records). Thus, Accounting was important for jobs in the finance function and for jobs in operations/distribution and materials functions, and it was also slightly more important for upper-level jobs. Thus, it appeared that Accounting was a significant and important aspect of some but not all management jobs. No previous studies were found in which Legal Affairs was identified as a separate factor. It may have emerged in this study due to the highly regulated nature of companies in the medical specialties business. Legal Affairs may not be as salient in other organizations.

The technical knowledge requirements of management and professional jobs had not been studied at all in previous research, as they were in this study. Nonetheless, the results of this study showed that they were meaningful and provided valuable and unique information beyond the task activities. Analysis of technical knowledge requirements should be included in future management/professional job analysis studies.

The individual abilities identified in this study to some extent confirmed the results of trait studies of leadership and to some extent they provided unique information, some of which may have been specific to the organization in this study. The Impact/Influence ability factor characterized perfectly a requirement of management jobs in this organ-

ization (T. Hill, personal communication, Apr. 2, 1984). Impact/Influence included characteristics such as self-confidence, tenacity, enthusiasm, persuasiveness, verbal communication ability, and tactfulness. Results Orientation was similar to the "action orientation" that Peters and Waterman (1982) found to be characteristic of excellent companies. The company in this study attempts to hire new management and professional employees on the basis of their Results Orientation, although it is difficult to assess accurately. The present findings confirmed that a Results Orientation characteristic does exist in the organization. It involved setting high standards and producing high quality results in a timely manner. The Lead Others and Decision Making ability factors reflected leadership and administrative abilities that were found to be important in numerous other studies. The Work Style ability factor was somewhat unique compared to other studies. It dealt partly with working effectively with others, which seemed to be an interpersonal ability, but it also included the ability to explain technical material, to be practical, creative, and to communicate in writing. Thus, it seemed to reflect the importance of good communication for working effectively with others. The Public Speaking factor was somewhat specific and dealt with making public presentations and selling to the public.

In summary, the characteristics identified in this study were confirmatory of previous studies and they also provided some new and important aspects of management/professional jobs.



## Differences by Levels and Functions

The major finding of the analysis of management and professional jobs across different organizations functions and levels was that there were broad differences across the different groups of jobs. The results confirmed the conclusion by Pavett and Lau (1983) that managers are not as homogeneous a group as has been traditionally assumed. Broad differences were found across jobs on task, knowledge, and ability requirements.

Some functions could be classified as unispecialist functions, e.g., Electronic Data Processing, Finance, and Legal Affairs. These functions showed high importance on factors directly related to their functions, but low importance on almost all the other factors. Other functions could be classified as multispecialist functions, e.g., Business Planning and Development, Regulatory Affairs, and Executive functions. These functions showed high importance on a wide variety of activities, technical knowledge, and individual ability requirements. Clearly, multispecialist functions are more complex and require incumbents with more diverse skills and abilities than unispecialist functions.

The results tended to confirm the conclusion by Thornton and Byham (1982) that the biggest change in management jobs is from entry level supervisory positions into beginning management positions. However, the results also showed an almost equally large change from middle management positions into top level executive positions. The scope of the activities, knowledge, and abilities was much broader for the top level jobs as compared to middle management jobs.

Top level executive positions were highest on most all the activities, knowledge, and ability factors. These results could be criticized on the grounds that they were based on self-report data, but the pattern of results across different levels and functions was very confirmatory and was consistent with what would be expected. Entry level/supervisory jobs were lowest on virtually all activities, knowledge, and abilities. This indicated that these jobs were very specialized, and they were low on most activities and knowledge except in their areas of specialization. When averaged over all jobs as a group, they were below the average in all areas. Each step up the hierarchy was characterized by an increase in Planning activities and Financial and Sales knowledge, and a decrease in Production/Engineering activities. Upper-level jobs also showed broader and more generalized requirements than lower level jobs. Also, comparison of the jobs on normative standard scores should have reduced the biases due to self-report. It appeared that top level executives were involved in many activities and required superior technical knowledge and personal abilities.

Some task, knowledge, and ability factors were consistently associated with upper-level management positions. The profiles for the top level jobs (Figure 7) and for the executive function (Figure 21) indicated that Planning/Decision Making/Controlling activities, and Sales, Finance, and Personnel knowledge, and Public Speaking ability were especially characteristic of upper-level positions. These factors also showed the highest correlations of all factors with salary points ( $r =$

.55, .34, .39, .34, and .43, respectively). The Selling and Marketing activity factor also correlated highly with salary points ( $r = .40$ ). Rusmore (1973) proposed that certain tasks comprising individual positions may be associated with advancement to higher-level positions, and these results tended to confirm his proposition. It would seem that incumbents involved in these activities and knowledge areas would be more likely to advance than people involved in activities that showed low correlations with salary points, e.g., Computers (.04), Engineering/Production (.04), Engineering (.04), and Production/Manufacturing (.07). The keys to advancement in this organization appeared to be involvement in Planning activities, and knowledge of "people, money and markets."

The last point about differences across levels and functions is that Managing Others activities and several technical knowledge areas increased in importance with hierarchical levels rather than decreased as would have been expected on the basis of previous research. One explanation for this unexpected finding is that the measures in this study were more sensitive to level changes than those used in other studies. For example, Guglielmino (1979) used only seven general items to measure technical knowledge requirements, whereas nine factors were empirically derived from 65 specific items to measure technical knowledge requirements in this study. Thus, this study could have covered more technical knowledge areas than have been used in other studies, and the ones that showed increases with management levels were just not covered in other studies. Another possible explanation is that the

organization in this study had a very decentralized structure, and consequently managers and executives had more opportunities and needs to engage in Managing activities and to utilize technical knowledge on the job. It would be interesting to compare the results of this study with the results from a more centralized organization.

### Applications to Personnel Practices

Gomez-Mejia and Page (1983) described an excellent system for integrating employee development and performance appraisal based on accurate job information such as was derived in this study. The job analysis results are used to establish the performance factors for groups of jobs (e.g., job functions). These performance factors are then used to establish goals and objectives for the job in a work plan, and then they are used again in the performance appraisal process to evaluate progress toward the goals and objectives. The performance factors that might be used for the operations/distribution function are listed in Table 19.

The tasks, knowledge, and abilities are listed in order of highest standard importance scores, and only the factors with scores above the overall mean are listed (see Figure 11). The manager and job incumbent could set work related and developmental goals for each of these areas. The goals for each of the areas could be recorded and then used for evaluation at a later date.

Based on the appraisal inputs, an individualized developmental plan is created to help strengthen the areas identified as weaknesses

TABLE 19

## Performance Factors for Operations/Distribution Function

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<u>Tasks</u>	<u>Knowledge</u>	<u>Abilities</u>
2.8 Managing Others	2.3 Distribution	2.9 Lead Others
1.5 Accounting	1.6 Finance	3.0 Impact/Influence
1.8 Planning/Decision Making/Controlling	1.2 Personnel	2.5 Decision Making
1.4 Engineering/ Production		
2.5 Interacting with Others		
0.9 Legal Affairs		

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and to capitalize on strenghts that may not be used sufficiently on the current job. Gomez-Mejia and Page (1983) developed a comprehensive directory of development activities to facilitate the development process. Development activites were listed for each job factor in three general categories: on the job development activities, suggested readings, and relevant internal seminars and courses. For each performance factor there were about 12 developmental activities. The developmental activities for the Planning/Decision Making/Controlling factor might include the ones listed below:

1. Preparation of area budget - on the job training
2. Lead and conduct staff meetings - on the job training

3. Analyze operating performance reports - on the job training
4. Make forecasts and projections into planning activities - strategic planing seminar and on the job training.
5. Plan policies and programs - seminar on organizational policies and on the job training.

These activities were derived from the list of tasks that made up the factor, and similar lists could be derived for the other factors. Following each activity is a brief description of where the skill or ability to perform the activity might be acquired. Some of the knowledge factors might even include formal education to acquire the necessary knowledge. Job incumbents could participate in designing the developmental activities. One advantage of the activities is that they emphasize on the job training, and they are flexible to fit the specific needs and interests of the job incumbents.

To integrate the system with career planning, the profile of performance dimensions for the next level job could be compared to the profile for the current job. The differences in profiles would show where the incumbent needed to gain experience and skill in order to be ready for the next level job. Goals could be established in line with the work requirements and career expectations. Thus, the job analysis results are used as the basis for an integrated system of performance appraisal, training, and career planning.

The performance factors listed in Table 17 could also be used as a basis for identification of selection criteria. Structured interviews could be designed to obtain specific information about knowledge

and experience related to the important performance factors for the different groups of jobs. Standardized tests could be developed to assess job candidates on the technical knowledge areas required for the job. The information collected from the job analysis would serve as the basis for developing these procedures and would insure that the selection procedures were linked to specific job requirements. This procedure would result in legally defensible selection practices.

Another possible application of the results has already been alluded to. They could be used as the basis for setting salary grades for the jobs. Several factors were already identified that correlated highly with salary points. The factors could be combined into a multiple regression equation to predict salary points. Then the regression weights could be applied to the job analysis results to determine the salary rates for jobs. Gomez-Mejia et al. (1979) have had considerable success in using this type of procedure with job analysis results from the Position Description Questionnaire described in the literature review section. The results of this study would have to be refined specifically for this purpose, but the high correlations of some of the factors with salary points indicates that the results might be applicable.

Another possible application of the results would be to identify important dimensions in addition to those used in assessment centers for the identification of managerial talent. Current assessment center techniques evaluate job candidates on general process factors such as communication skills, energy, job motivation, planning and organizing,

and others (Thornton & Byham, 1982). The technical activity and knowledge requirements identified in this study could be evaluated by candidates' superiors or standardized tests, and the process skills could be evaluated by the assessment center.

The types of applications described here would take considerable more research to work up the specific frameworks for them, but the front end research has already been done, and the result would be fair and legally defensible personnel practices based on accurate job information.

### Future Research

One area of future research would be to develop the frameworks required to implement the personnel practices described above. Another intriguing possibility would be to compare task, knowledge, and ability profiles of different types of organizations to see if any differences emerged. It was suggested that in more centralized organizations higher level jobs might not show as high importance on Managing Others and technical knowledge requirements as was found in this study. Another possibility would be to study a high technology organization, such as one involved in computer products, to see if technical knowledge requirements are even more important at all levels of management than they were in this study. It would also be interesting to compare the profiles of manufacturing and service industries such, as a bank. Manufacturing organizations might show high importance on Production/Engineering activities and knowledge at all levels of jobs, whereas the



service organizations might show higher importance on Sales and Marketing activities and knowledge.

The questionnaire would probably have to be modified slightly to be appropriate to study these different organizations. Biochemistry/Medical was an organization specific factor in this study. This organization specific knowledge factor should be changed to the specialty of the organization. In a bank this factor might involve bonds, interest rates, and investments. In a computer industry it would involve computers, in an automobile industry it would involve cars, and so on. Interviews with a sample of job incumbents could be conducted to learn if any other areas of the questionnaire would need to be modified. Most areas of the questionnaire would probably be appropriate for most all organizations, e.g., Sales, Finance, Production, Managing, Planning, Interacting, and so on. The data from other organizations could be factor analyzed to see if the same factor structure emerged. The same basic structure with only minor differences would probably emerge in most organizations. This type of comparative research would show the robustness of the taxonomy across different organizations, and could be used to identify organizational characteristics that are associated with successful companies.

Peters and Waterman (1982) recently attempted to identify the characteristics of "excellent companies." They used a qualitative approach in their research. The management/professional job taxonomy could be used to study the characteristics of excellent companies using a quantitative analysis. For example, it might be found that Sales and

Marketing, Research, and Results Orientation are the most important characteristics in successful companies. Once the characteristics of excellent companies were identified, the taxonomy could be used to diagnose problems in organizational management. The profiles could be used to show the importance placed on the task, knowledge, and ability factors, and to identify deviations from the optimal profile at each hierarchical level and organizational function. The results could be used as a guide for organization planning, design, and change.

In summary, a reliable, valid, and quantitative management/professional job taxonomy was identified. The taxonomy was consistent with recent popular approaches to the description of management jobs (e.g., Mintzberg, 1971, 1975; Gomez-Mejia et al., 1979), and this taxonomy was more comprehensive in that it included analysis of process and technical job activities, technical knowledge, and individual ability requirements. The taxonomy can be used to design personnel practices including selection, performance appraisal, and career planning, and for organizational diagnosis, planning, and design. Suggestions for future research focused on investigating the robustness of the taxonomy in different types of organizations, and identification of characteristics associated with organizational success.

## REFERENCES

- Alwin, D. F., & Jackson, D. J. (1979). Measurement models for response errors in surveys: Issues and applications. In K. F. Schuessler (Ed.), Sociological methodology, San Francisco: Jossey-Bass.
- Anastasi, A. (1982). Psychological testing (Fifth edition). New York: Macmillan.
- Baehr, M. E. (1967). A framework for job descriptions for higher-level personnel. Unpublished manuscript, Industrial Relations Center, The University of Chicago.
- Barnard, C. I. (1938). The functions of the executive. Cambridge: Harvard University Press.
- Bass, B. M. (1981). Stogdill's handbook of leadership: A Survey of theory and research (Revised and expanded edition). New York: The Free Press.
- Bryant, F. B., & Veroff, J. (1982). The structure of psychological well-being: A sociohistorical approach. Journal of Personality and Social Psychology, 43, 653-673.
- Calby, P. (1981). Organizational surveys and employee attitudes: A review and a field study. Unpublished master's thesis, Loyola University of Chicago.
- Campbell, J. P., Dunnette, M. D., Lawler, E. E., & Weick, K. E. (1970). Managerial behavior, performance, and effectiveness. New York: McGraw Hill.
- Crooks, L. A. (1979). Historical perspective - Hemphill's executive position description questionnaire. In T. E. Standing (Chairman), Proceedings of the executive study conference. Cleveland, Ohio.
- Flanagan, J. C. (1951). Defining requirements of the executive's job. Personnel, 28, 28-35.
- Fleishman, E. A. (1953). The description of supervisory behavior. Journal of Applied Psychology, 37, 1-6.

- Gomez-Mejia, L. R., & Page, R. C. (1983). Integrating employee development and performance appraisal. Training and Development Journal, June, 138-145.
- Gomez-Mejia, L. R., Page, R. C., & Tornow, W. W. (1979). Traditional versus statistical job evaluation: Development and comparison of different job evaluation approaches, using the position description questionnaire. Personnel research report #169-79, Control Data Corporation.
- Gorsuch, R. L. (1974). Factor analysis. Philadelphia: W. B. Saunders Company.
- Guglielmino, P. J. (1979). Developing the top-level executive for the 1980's and beyond. Training and Development Journal, April, 12-14.
- Guion, B. (1979). Summary and discussion. Analyzing management jobs: research and application. In T. E. Standing (Chairman), Proceedings of the executive study conference. Cleveland, Ohio.
- Hemphill, J. K. (1959). Job descriptions for executives. Harvard Business Review, 37, 55-67.
- Hemphill, J. K. (1960). Dimensions of executive positions. Columbus: Ohio State University, Bureau of Business Research.
- Hill, T., & Rucci, A. (1982). Management-professional job analysis inventory. Evanston, IL.: Am. Hosp. Supply Corp.
- Hull, C. H., & Nie, H. H. (1979). SPSS update: New procedures for releases 7 and 8. St. Louis: McGraw-Hill.
- Jackson, D. N., & Chan, W.D. (1980). Maximum-likelihood estimation in common factor analysis: A cautionary note. Psychological Bulletin, 88, 502-508.
- Joreskog, K. G. (1969). A general approach to confirmatory maximum-likelihood factor analysis. Psychometrika, 34, 183-202.
- Kim, J., & Mueller, C. W. (1982). Factor analysis: Statistical methods and practical issues. Beverly Hills, CA: Sage Publications.
- King, L. M. & Boehm, V. R. (1981). Exempt job analysis study. Management report, The Standard Oil Company.
- Krzystofiak, F., Newman, J. M., & Anderson (1979). A quantified approach to the measurement of job content: Procedures and payoffs. Personnel Psychology, 32, 341-357.

- Landy, F. J., & Trumbo, D. A. (1980). Psychology of work behavior (Revised edition). IL: Dorsey Press.
- Mahoney, T. A., Jerdee, T. H., & Carroll, S. I. (1965). The job(s) of management. Industrial Relations, 4, 97-110.
- McCormick, E. J. (1979). Job analysis: methods and applications. New York: AMACOM.
- Miner, M. G., & Miner, J. B. (1979). Employee selection within the law. Washington, D.C.: The Bureau of National Affairs.
- Mintzberg, H. (1971). Managerial work: Analysis from observation. Management Science, 18, B97-B109.
- Mintzberg, H. (1975). The manager's job: Folklore and fact. Harvard Business Review, 53, 49-61.
- Mitchell, J. L. (1978). Structured job analysis of professional and managerial positions. Ann Arbor, MI: University Microfilms International.
- Muchinsky, P. M. (1983). Psychology applied to work. Homewood, IL: Dorsey Press.
- Pavett, C. M. & Lau, A. W. (1983). Managerial work: The influence of hierarchical level and functional specialty. Academy of Management Journal, 26, 170-177.
- Peters, T. J., & Waterman, R. H. (1982). In search of excellence. New York: Harper & Rowe.
- Porter, L. W., & Lawler, E. E. III (1968). Managerial attitudes and performance. Homewood, IL: Richard D. Irwin.
- Prien, E. P. (1963). Development of a supervisor position description questionnaire. Journal of Applied Psychology, 47, 10-14.
- Prien, E. P., & Ronan, W. W. (1971). Job analysis: A review of research and findings. Personnel Psychology, 24, 371-396.
- Ramos, B. (1979). Management abilities and activities. In T. E. Standing (Chairman), Proceedings of the executive study conference. Cleveland, Ohio.
- Rusmore, J. T. (1973). Position description factors and executive promotion. Personnel Psychology, 26, 135-138.
- SAS user's guide: Statistics, 1982 edition. (1982). Cary, NC.: SAS Institute, Inc.

- Thornton, G. C., & Byham, W. C. (1982). Assessment centers and managerial performance. New York: Academic Press.
- Tornow, W. W., & Pinto, P. R. (1976). The development of a managerial job taxonomy: A system for describing, classifying, and evaluating executive positions. Journal of Applied Psychology, 61, 410-418.
- Tornow, W. (1979). Building on the EPDQ for management job evaluation. In T. E. Standing (Chairman), Proceedings of the executive study conference. Cleveland, Ohio.
- Uniform guidelines on employee selection procedures (1978). Federal Register (August 25). In Miner, M. G., & Miner, J. B. (1979). Employee selection within the law. Washington, D.C.: The Bureau of National Affairs.
- Williams, A. T. M. (1956). A description of some executive abilities by means of the critical incident technique. Unpublished doctoral dissertation, Columbia University.
- Yankelovich, D. (1979). Work, values, and the new breed. In C. Kerr & J. M. Rosow (Eds.), Work in America: The decade ahead. Cincinnati: Van Nostrand Company, 3-26.

APPENDIX A

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# Management- Professional Job Analysis Inventory

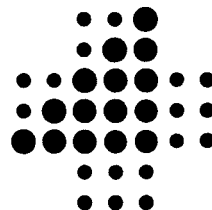
# American Hospital Supply Corporation

\_\_\_\_\_  
Name

\_\_\_\_\_  
Job Title

\_\_\_\_\_  
Division

\_\_\_\_\_  
Location





## MANAGEMENT PROFESSIONAL JOB ANALYSIS

We would appreciate your cooperation in a project that is being undertaken by the Corporate Personnel Planning and Research Department. The project is directed at conducting a corporate-wide Management/Professional Job Analysis.

The job analysis will be used to document what tasks are part of your job, under what circumstances the job is performed, and what knowledge, skills, and abilities are necessary to do your job. The information will be used to help us design or refine career planning (with specific career paths), performance appraisal, training, and selection programs.

This inventory is divided into four sections:

Section I contains a list of job activities that you might perform in your present job. You are requested to indicate the importance of each activity.

Section II contains a list of technical knowledge content areas that may be required to perform your job. You are requested to rate the degree to which each area is needed in your job.

Section III contains a list of skills and abilities that may be needed to perform your job. You are requested to rate the degree to which each skill or ability is needed in your job.

Section IV contains a list of job conditions which may or may not characterize your position. You are requested to rate the degree to which these conditions are a part of your job.

The questionnaire will require about one hour to complete.

Since we have sampled only a small portion of the management/professional workforce, each questionnaire is very important and will have a significant impact on the results of this study.

As a participant in this study, your response will be kept strictly confidential. Only members of the corporate Personnel Planning and Research Department will have access to the data, and only aggregate data will be reported.

**SECTION I: JOB ACTIVITIES**

This section contains a wide assortment of work activities performed by employees in managerial/professional positions. They are listed under generic dimension and reflect the many functional areas of work performed in American, as well as all levels of organizational responsibility.

Please read each item and then write in the box next to the item the Scale level (0-4) which best describes the extent to which it is a required part of your position. (Refer to the scale shown below.)

When making your judgments, consider and weigh both the IMPORTANCE and the relative FREQUENCY of its occurrence, relative to all other activities which make up this position.

**NOTE:**  
Items left blank will be interpreted as a "0" (Not required).

**IMPORTANCE SCALE**

- 0 - Not required in my position.
- 1 - Of minor importance for successful performance
- 2 - Of some importance for successful performance
- 3 - Very important for successful performance
- 4 - Critically important for successful performance

**NOTE:**

Items left blank will be interpreted as a "0" (Not required).

**IMPORTANCE SCALE**

- |   |   |   |
|---|---|---|
| 0 | - | Not required in my position                           |
| 1 | - | Of <u>minor</u> importance for successful performance |
| 2 | - | Of <u>some</u> importance for successful performance  |
| 3 | - | Very important for successful performance             |
| 4 | - | Critically important for successful performance       |

**COMMUNICATING**Card 1

- |    |     |   |
|----|-----|---|
| 20 | ___ | Explain divergence between plans and actual outcomes.               |
| 21 | ___ | Write technical research or analytical reports                      |
| 22 | ___ | Prepare material for inclusion in policy or procedural manuals.     |
| 23 | ___ | Write position papers, policy letters, proposals, etc.              |
| 24 | ___ | Explain Company policies.   |
| 25 | ___ | Prepare and present written goals and plans for operating areas.    |
| 26 | ___ | Make presentations to the Board of Directors or Corporate officers. |
| 27 | ___ | Write articles for internal publications.                           |
| 28 | ___ | Write reports summarizing information from various sources.         |
| 29 | ___ | Initiate correspondence or memoranda on an almost daily basis.      |
| 30 | ___ | Prepare news releases or other communications to the public.        |
| 31 | ___ | Prepare speeches.   |
| 32 | ___ | Testify in court or other public hearings.                          |
| 33 | ___ | Communicate with customers and/or outside suppliers.                |
| 34 | ___ | Make presentations to management.                                   |
| 35 | ___ | Make public speeches.   |
| 36 | ___ | Communicate with others to inform, instruct, or train.              |
| 37 | ___ | Explain technical material to non-technical audiences.              |
| 38 | ___ | Write contracts.  |

**NOTE:**

Items left blank will be interpreted as a "0" (Not required).

**IMPORTANCE SCALE**

- |   |  |
|---|--|
| 0 | - Not required in my position                            |
| 1 | - Of <u>minor</u> importance for successful performance  |
| 2 | - Of <u>some</u> importance for successful performance   |
| 3 | - <u>Very important</u> for successful performance       |
| 4 | - <u>Critically important</u> for successful performance |

**INFLUENCING/SELLING**

- 39        \_\_\_        Prepare presentations on new ideas or programs to be evaluated by higher level management.
- 40        \_\_\_        Communicate with customers in person or by telephone.
- 41        \_\_\_        Write articles for the monthly merchandising or sales book/bulletin.
- 42        \_\_\_        Seek out and contact potential customers.
- 43        \_\_\_        Direct overall day-to-day sales operations in assigned territory.
- 44        \_\_\_        Promote the company's products, services, or programs.
- 45        \_\_\_        Sell company products and/or services.
- 46        \_\_\_        Use various sales techniques to fit the situation.
- 47        \_\_\_        Persuade others to take action or change their point of view.
- 48        \_\_\_        Entertain others to create a positive impression of product or service.
- 49        \_\_\_        Identify and overcome objections to product, service, or program.
- 50        \_\_\_        Ask questions to obtain information and that will help you persuade others.
- 51        \_\_\_        Encourage cooperation and openness in others.
- 52        \_\_\_        Explain in detail features of products or services.
- 53        \_\_\_        Work with sales support systems.
- 54        \_\_\_        Schedule sales calls.
- 55        \_\_\_        Gain commitment for product, services, or program.
- 56        \_\_\_        Review Sales performance records.

**NOTE:**

Items left blank will be interpreted as a "0" (Not required).

**IMPORTANCE SCALE**

- |  |
|--|
| 0 - <u>Not required</u> in my position                     |
| 1 - <u>Of minor importance</u> for successful performance  |
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**CONSULTING & COORDINATING**

- 57        \_\_\_    Resolve conflicts among departments and/or operating units.
- 58        \_\_\_    Consult with lawyers.
- 59        \_\_\_    Provide legal advice to management.
- 60        \_\_\_    Edit documents or reports prepared by others.
- 61        \_\_\_    Assist in the design and installation of computer-based systems.
- 62        \_\_\_    Counsel and assist employees not under your direct supervision.
- 63        \_\_\_    Participate in community-related matters relevant to the business.
- 64        \_\_\_    Negotiate agreements.
- 65        \_\_\_    Provide staff advice or assistance to line managers.
- 66        \_\_\_    Resolve conflicts between others.
- 67        \_\_\_    Confer with scientific or technical person.
- 68        \_\_\_    Serve as a consultant to other divisions of American.
- 69        \_\_\_    Provide engineering input to line managers.
- 70        \_\_\_    Give professional advice and specialized assistance.
- 71        \_\_\_    Coordinate conferences or meetings.
- 72        \_\_\_    Coordinate marketing and sales programs.
- 73        \_\_\_    Coordinate interdivisional programs.
- 74        \_\_\_    Maintain contact with other units, departments, or divisions to keep informed of developments.
- 75        \_\_\_    Locate and provide information to others.

**NOTE:**

Items left blank will be interpreted as a "0" (Not required).

**IMPORTANCE SCALE**

- |   |   |  |
|---|---|--|
| 0 | - | Not required in my position                            |
| 1 | - | Of <u>minor</u> importance for successful performance  |
| 2 | - | Of <u>some</u> importance for successful performance   |
| 3 | - | <u>Very important</u> for successful performance       |
| 4 | - | <u>Critically important</u> for successful performance |

**Card 2 DECISION MAKING**

- 20     \_\_\_     Make forecasts and projections as input into planning activities.
- 21     \_\_\_     Make repeated decisions according to predetermined policy or procedure.
- 22     \_\_\_     Make personnel selection decisions.
- 23     \_\_\_     Price products or services.
- 24     \_\_\_     Choose among several courses of action based on obtained information.
- 25     \_\_\_     Manage stocks, bonds, real estate holdings or other corporate financial assets.
- 26     \_\_\_     Establish planning guidelines which others must follow.
- 27     \_\_\_     Recommend and/or develop operational policies and procedures.
- 28     \_\_\_     Approve request to expand resources.
- 29     \_\_\_     Allocate and schedule resources to ensure their availability when needed.
- 30     \_\_\_     Authorize long-term programs and financial commitments.
- 31     \_\_\_     Approve the introduction of new products, services or programs.
- 32     \_\_\_     Approve budgets.
- 33     \_\_\_     Make decisions regarding the most efficient systems or programs.
- 34     \_\_\_     Set or approve standard specifications.
- 35     \_\_\_     Establish sales goals.
- 36     \_\_\_     Requisition materials, equipment or supplies.
- 37     \_\_\_     Authorize contracts.
- 38     \_\_\_     Cancel or discontinue current programs, products or services.
- 39     \_\_\_     Authorize the release or rejection of product or services.

**NOTE:**  
 Items left  
 blank will be  
 interpreted as  
 a "0" (Not  
 required).

IMPORTANCE SCALE	
0	- <u>Not required</u> in my position
1	- Of <u>minor</u> importance for successful performance
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3	- <u>Very important</u> for successful performance
4	- <u>Critically important</u> for successful performance

#### INTERACTING WITH OTHERS

- 40            \_\_\_ Conduct informal meetings.
- 41            \_\_\_ Entertain visiting dignitaries.
- 42            \_\_\_ Work with outside consultants or contractors.
- 43            \_\_\_ Work with persons from other functional areas.
- 44            \_\_\_ Act as project leader.
- 45            \_\_\_ Participate in committee or task force assignments.
- 46            \_\_\_ Conduct interviews.
- 47            \_\_\_ Train others.
- 48            \_\_\_ Counsel with subordinates on personal problems.
- 49            \_\_\_ Meet with others to solve problems.
- 50            \_\_\_ Conduct formal meetings.
- 51            \_\_\_ Work with others in a counseling role.
- 52            \_\_\_ Work with others to accomplish goal.
- 53            \_\_\_ Deal with representatives of local, state, or federal government.
- 54            \_\_\_ Secure information from others.
- 55            \_\_\_ Negotiate with others.
- 56            \_\_\_ Deal with persons who seek to sell a product, service,  
 or program to American.
- 57            \_\_\_ Participate in orientation of new employees.
- 58            \_\_\_ Work with others in informal groups.

**NOTE:**

Items left blank will be interpreted as a "0" (Not required).

**IMPORTANCE SCALE**

- |  |
|--|
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| 3 - <u>Very important</u> for successful performance       |
| 4 - <u>Critically important</u> for successful performance |

**CREATIVITY**

- 59        \_\_\_ Design experiments, investigations, or studies.
- 60        \_\_\_ Develop marketing concepts and strategies.
- 61        \_\_\_ Design methods and procedures for testing products and systems.
- 62        \_\_\_ Develop computer programs.
- 63        \_\_\_ Design or develop training programs.
- 64        \_\_\_ Design surveys.
- 65        \_\_\_ Develop strategies to maintain or enhance American's financial position.
- 66        \_\_\_ Develop advertising and promotion programs.
- 67        \_\_\_ Design equipment.
- 68        \_\_\_ Design facilities.
- 69        \_\_\_ Create new products or services.
- 70        \_\_\_ Find new way of carrying out tasks that improve results.
- 71        \_\_\_ Make suggestions for improving products, services, or programs.
- 72        \_\_\_ Initiate improvement in work method or procedure.
- 73        \_\_\_ Recommend changes or revisions of operating procedures.
- 74        \_\_\_ Formulate programs to improve technical capability.
- 75        \_\_\_ Adapt products, procedures, or services to local plant production or use.

80-2

Card 3

- 20        \_\_\_ Develop solutions to unique or non-recurring problems.
- 21        \_\_\_ Design business systems or strategies.
- 22        \_\_\_ Develop programs or systems to enhance sales.



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required).

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#### PROBLEM SOLVING

- 23           \_\_\_ Adjust schedules to meet emergencies.
- 24           \_\_\_ Deal with people problems.
- 25           \_\_\_ Participate in emergency action planning.
- 26           \_\_\_ Identify and state research objectives or problems.
- 27           \_\_\_ Draw conclusions from limited data.
- 28           \_\_\_ Analyze operating performance reports.
- 29           \_\_\_ Read and interpret schematics, blueprints, or other  
              technical drawings.
- 30           \_\_\_ Find less expensive ways to accomplish goals.
- 31           \_\_\_ Manage corporate litigation and judicial proceedings.
- 32           \_\_\_ Evaluate new competitive products.
- 33           \_\_\_ Evaluate techniques or systems.
- 34           \_\_\_ Identify inconsistencies in information.
- 35           \_\_\_ Identify the source or cause of problems.
- 36           \_\_\_ Interpret research results.
- 37           \_\_\_ Identify or develop new markets for products or services.
- 38           \_\_\_ Analyze reports.
- 39           \_\_\_ Conduct statistical analyses.

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required).

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**PROBLEM SOLVING (cont'd)**

- 40           \_\_\_ Compute costs.
- 41           \_\_\_ Apply technical knowledge in meeting job objectives.
- 42           \_\_\_ Recruit new employees.
- 43           \_\_\_ Identify problems requiring immediate attention.
- 44           \_\_\_ Evaluate the relevance or importance of information.
- 45           \_\_\_ Prepare for potential litigation.
- 46           \_\_\_ Operate electronic data processing equipment.
- 47           \_\_\_ Requisition materials, equipment, or supplies to meet needs.
- 48           \_\_\_ Arrange for the services of outside contractors.
- 49           \_\_\_ Assemble facts for distribution.
- 50           \_\_\_ Evaluate product, service, or program to ensure it meets government regulations.
- 51           \_\_\_ Engage in trouble shooting activities.
- 52           \_\_\_ Read people and respond appropriately.
- 53           \_\_\_ Solve manufacturing or operational problems.
- 54           \_\_\_ Determine the allocation of money or other scarce resources.
- 55           \_\_\_ Improve sales or profits.

**NOTE:**

Items left blank will be interpreted as a "0" (Not required).

**IMPORTANCE SCALE**

- |   |  |
|---|--|
| 0 | - Not required in my position                            |
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| 3 | - <u>Very important</u> for successful performance       |
| 4 | - <u>Critically important</u> for successful performance |

**MONITORING & CONTROLLING**

- |    |     |   |
|----|-----|---|
| 56 | ___ | Perform quality control tests.  |
| 57 | ___ | Oversee the assessment, remittance, and reporting of revenues due the company.          |
| 58 | ___ | Initiate documents for corporate transactions.  |
| 59 | ___ | Audit effectiveness and impact of services rendered by external concerns.               |
| 60 | ___ | Deal with the loss of the company's money.  |
| 61 | ___ | Ensure that product or service specifications are met.                                  |
| 62 | ___ | Be concerned with claims for loss, damage or overcharge.                                |
| 63 | ___ | Perform evaluations at a departmental level.  |
| 64 | ___ | Establish or exercise expense controls.   |
| 65 | ___ | Inspect new materials or products.  |
| 66 | ___ | Preview proposals for adequacy.   |
| 67 | ___ | Prepare financial statements.   |
| 68 | ___ | Monitor progress toward goals to maintain managerial control.                           |
| 69 | ___ | Collect and prepare information usually in the form of research, reports, and accounts. |
| 70 | ___ | Measure and record output.  |
| 71 | ___ | Maintain proper inventory levels.   |
| 72 | ___ | Set up and monitor internal business controls.  |
| 73 | ___ | Examine, analyze, or interpret records.   |
| 74 | ___ | Do financial audits.  |
| 75 | ___ | Keep detailed and accurate records.   |

**NOTE:**  
Items left  
blank will be  
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a "0" (Not  
required).

IMPORTANCE SCALE	
0	- <u>Not required</u> in my position
1	- Of <u>minor</u> importance for successful performance
2	- Of <u>some</u> importance for successful performance
3	- <u>Very important</u> for successful performance
4	- <u>Critically important</u> for successful performance

#### MONITORING & CONTROLLING (cont'd)

80-3	76	___	Review and revise budgets and allocations.
<u>Card 4</u>			
	20	___	Review and evaluate others' decisions.
	21	___	Use accounting procedures.
	22	___	Fill out standardized forms or reports.
	23	___	Evaluate employee compliance with operating or safety rules.
	24	___	Monitor adherence to procedures set forth in agreements and contracts with external concerns.
	25	___	Compile financial reports and statements.
	26	___	Review forecasts.
	27	___	Review sales performance records.
	28	___	Analyze and evaluate processes or equipment designed for effectiveness and cost.
	29	___	Compare actual performance with forecasts, schedules, and/or budgets.
	30	___	Review published literature.
	31	___	Evaluate the effectiveness of programs and recommend changes.
	32	___	Assess the efficiency of operations.
	33	___	Prepare production records.
	34	___	Perform engineering evaluation.
	35	___	Prepare purchase requisitions.
	36	___	Monitor compliances with law or government regulations.
	37	___	Monitor the efforts or results of other people.
	38	___	Monitor compliance with corporate policy or procedures.

**NOTE:**

Items left blank will be interpreted as a "0" (Not required).

**IMPORTANCE SCALE**

- |   |  |
|---|--|
| 0 | - <u>Not required</u> in my position                     |
| 1 | - <u>Of minor importance</u> for successful performance  |
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| 3 | - <u>Very important</u> for successful performance       |
| 4 | - <u>Critically important</u> for successful performance |

**PLANNING**

- 39        \_\_\_        Schedule the availability of material or equipment required to meet objectives.
- 40        \_\_\_        Participate in facilities planning.
- 41        \_\_\_        Schedule the work of others.
- 42        \_\_\_        Prepare plans to meet future requirements.
- 43        \_\_\_        Develop detailed courses of action to achieve objectives.
- 44        \_\_\_        Prepare area budget.
- 45        \_\_\_        Plan policies and programs.
- 46        \_\_\_        Participate in long-range planning activity.
- 47        \_\_\_        Provide input in business development planning.
- 48        \_\_\_        Plan the analysis of data.
- 49        \_\_\_        Plan department practices or procedures.
- 50        \_\_\_        Develop strategies to maintain or enhance American's financial position.
- 51        \_\_\_        Provide input to strategic planning.
- 52        \_\_\_        Provide input to human resources planning.
- 53        \_\_\_        Participate in market planning.
- 54        \_\_\_        Participate in production planning.
- 55        \_\_\_        Schedule resources to accomplish goals.
- 56        \_\_\_        Plan and anticipate changes in organizational structure.

**NOTE:**  
Items left  
blank will be  
interpreted as  
a "0" (Not  
required).

IMPORTANCE SCALE	
0	- <u>Not required</u> in my position
1	- Of <u>minor</u> importance for successful performance
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4	- <u>Critically important</u> for successful performance

#### MANAGING OTHERS

- 57           \_\_\_    Lead and conduct staff meetings.
- 58           \_\_\_    Set goals for subordinates.
- 59           \_\_\_    Establish work priorities and standards for subordinates.
- 60           \_\_\_    Determine specific work procedures for subordinates.
- 61           \_\_\_    Conduct formal or informal performance-evaluation discussions  
                  with subordinates.
- 62           \_\_\_    Approve employee actions such as absence, tardiness, pay,  
                  vacation, leave, overtime, etc.
- 63           \_\_\_    Monitor and direct the day-to-day work of employees.
- 64           \_\_\_    Formally evaluate the performance of subordinates.
- 65           \_\_\_    Provide direct, on-the-scene supervision of employees.
- 66           \_\_\_    Assign duties to subordinates when a course of action is decided.
- 67           \_\_\_    Consult with subordinates on personal problems.
- 68           \_\_\_    Assist subordinates in problem solving.
- 69           \_\_\_    Delegate to subordinates.
- 70           \_\_\_    Participate in personal development of subordinates.
- 71           \_\_\_    Provide on-the-job training.
- 72           \_\_\_    Orient new employees.

**SECTION II: TECHNICAL KNOWLEDGE**

This section contains an assortment of technical knowledge content areas that may be necessary to successfully perform your job. Consider each of the following areas and in the space alongside rate (on the following scale) the extent to which it is required for successful performance in your job.

**KNOWLEDGE SCALE**

- 0 - Not required and never used in this position
- 1 - Somewhat helpful for facilitating activities involving other areas, but by no means required.
- 2 - A definite asset for effective performance, but not an absolute requirement.
- 3 - A critical requirement, the lack of which will severely limit ability to function effectively; in-depth familiarity is most helpful.
- 4 - Advanced, in-depth knowledge/skill is a must, licensing or other certification of this status may be required.

**NOTE:** Items left blank will be interpreted as a "0" (Not required).

**KNOWLEDGE SCALE**

- 0 - Not required and never used in this position  
 1 - Somewhat helpful for facilitating activities involving other areas, but by no means required.  
 2 - A definite asset for effective performance, but not an absolute requirement.  
 3 - A critical requirement, the lack of which will severely limit ability to function effectively; in-depth familiarity is most helpful.  
 4 - Advanced, in-depth knowledge/skill is a must, licensing or other certification of this status may be required.

NOTE: Items left blank will be interpreted as a "0" (Not required).

**TECHNICAL KNOWLEDGE**

73	___ Office management	33	___ Energy resources; Ecology
74	___ Operations	34	___ Inventory control
75	___ Psychology; Counseling; Personnel research	35	___ Sterilization
80-4 Card 5		36	___ Engineering, civil/structural
	Pricing	37	___ Engineering, R & D
20	___ (e.g., rates and divisions)	38	___ Engineering, quality
21	___ Printing; Photography; Audio-visual arts	39	___ Engineering, electrical
22	___ Program development	40	___ Engineering, industrial
23	___ Program evaluation	41	___ Engineering, mechanical
24	___ Public relations	42	___ Finance; Banking; Taxation
25	___ Purchasing	43	___ Government affairs; Civics
26	___ Real estate	44	___ Graphic arts; Drafting
27	___ Customer service	45	___ Industrial health; Medical science; Biology
28	___ Statistics	46	___ Mathematics
29	___ Bio-chemistry	47	___ Industrial relations
30	___ Computer-Software	48	___ Instructional methods; Classroom instruction
31	___ Computer-Hardware	49	___ Law
32	___ Electronics; Telecommunications	50	___ Marketing research



**KNOWLEDGE SCALE**

- 0 - Not required and never used in this position  
 1 - Somewhat helpful for facilitating activities involving other areas, but by no means required.  
 2 - A definite asset for effective performance, but not an absolute requirement.  
 3 - A critical requirement, the lack of which will severely limit ability to function effectively; in-depth familiarity is most helpful.  
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NOTE: Items left blank will be interpreted as a "0" (Not required).

**TECHNICAL KNOWLEDGE (cont'd)**

51	___ Business planning	68	___ Management - Production
52	___ Accounting	69	___ Management - Facilities
53	___ Auditing	70	___ Management - Marketing
54	___ Physics	71	___ Management - Personnel
55	___ Distribution	72	___ Management - Product
56	___ International Business	73	___ Management - Financial
57	___ Packaging	74	___ Management - Sales
58	___ Pharmacology	75	___ Transportation; Shipping; Receiving
59	___ Microbiology		
60	___ Chemistry	80-5	
61	___ Q.C. techniques	<u>Card 6</u>	
62	___ Medicine		
63	___ Selling techniques	20	___ Advertising
64	___ Clinical research	21	___ Regulatory Affairs
65	___ Nursing	22	___ Production planning
	General	23	___ Compensation
66	___ business administration	24	___ Good manufacturing procedures
67	___ Management - General	25	___ Creative writing

**SECTION III: INDIVIDUAL ABILITIES**

Successful performance in any job is dependent on a host of abilities or capabilities, possessed by the incumbent. Consider each of the following abilities and rate (on the following scale) each ability on the extent to which it is required for successful performance in your job.

**INDIVIDUAL ABILITIES SCALE**

- 0 Little or no ability/skill required for effective performance.
- 1 Some ability/skill required for effective performance.
- 2 Moderately high level of skill/ability required for effective performance.
- 3 High level of skill/ability required for effective performance.
- 4 Very high, advanced level of skill/ability required for effective performance.

**NOTE:** Items left blank will be interpreted as a "0" (Not required).

**INDIVIDUAL ABILITIES SCALE**

- 0 Little or no ability/skill required for effective performance.
- 1 Some ability /skill required for effective performance.
- 2 Moderately high level of skill/ability required for effective performance.
- 3 High level of skill/ability required for effective performance.
- 4 Very high, advanced level of skill/ability required for effective performance.

**NOTE:** Items left blank will be interpreted as a "0" (Not required).

**THE ABILITY TO:**

- |    |   |    |  |
|----|---|----|--|
| 26 | ___ Speak in public (formal presentation)   | 49 | ___ Motivate others                            |
| 27 | ___ Sell to the public or customers         | 50 | ___ Make decisions quickly                     |
| 28 | ___ Communicate verbally                    | 51 | ___ Take risks                                 |
| 29 | ___ Explain technical material              | 52 | ___ Make accurate decisions                    |
| 30 | ___ Be creative                             | 53 | ___ Be objective                               |
| 31 | ___ Communicate in writing                  | 54 | ___ Be political                               |
| 33 | ___ Adapt to changing situations            | 55 | ___ Learn quickly                              |
| 34 | ___ Have positive interpersonal relations   | 56 | ___ Be practical                               |
| 35 | ___ Train others                            | 57 | ___ Work with little or no direction           |
| 36 | ___ Delegate                                | 58 | ___ Work long hours                            |
| 37 | ___ Create good first impression            | 59 | ___ Grasp new ideas quickly                    |
| 38 | ___ Project self-confidence                 | 60 | ___ Work effectively with others               |
| 39 | ___ Have impact on others                   | 61 | ___ Control programs or departments            |
| 40 | ___ Be tenacious                            | 62 | ___ Develop subordinates                       |
| 41 | ___ Be tactful with others                  | 63 | ___ Lead others                                |
| 42 | ___ Supervise others                        | 64 | ___ Plan and organize                          |
| 43 | ___ Be assertive                            | 65 | ___ Show initiative                            |
| 44 | ___ Be persuasive                           | 66 | ___ Produce results in a timely manner         |
| 45 | ___ Be enthusiastic                         | 67 | ___ Set high standards                         |
| 46 | ___ Remain composed in difficult situations | 68 | ___ Be thorough                                |
| 47 | ___ Make unpopular decisions                |    | ___ Maintain stable performance under pressure |
| 48 | ___ Listen attentively                      | 69 | ___  |

**ABOUT THIS INVENTORY**

No instrument can produce a fully comprehensive understanding of everything required in a position. However, we do hope it is adequate for capturing major similarities and differences with other positions. If 100% stands for the adequate amount of information to describe this position, what percentage of adequate does your completed questionnaire represent?  
(CIRCLE ONE OF THE FOLLOWING PERCENTAGES.)

72-74  
(80-7)

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

Thank you for completing this questionnaire. If you have any comments, please feel free to make them in this space and then place the questionnaire in the enclosed envelope and deposit it in the mail.

APPENDIX B

## Appendix B

## TASK ACTIVITY FACTORS AND ITEMS ON EACH FACTOR

Items are listed in descending order of factor loadings which are shown to the left of each item with decimals omitted. Item numbers refer to original positions of items in the Management Job Analysis Inventory. Items were listed under the following general categories: Communicating (COMM); Influencing/Selling (INFL); Consulting/Coordinating (CONS); Decision Making (DM); Interacting with Others (INTER); Creativity (CREA); Problem Solving (PS); Monitoring and Controlling (MONIT); Planning (PLAN); and Managing Others (MANAGE). The results are based on a maximum-likelihood factor analysis with varimax rotation.

Managing Others

- 87 MANAGE3 Establish work priorities and standards for subordinates.
- 87 MANAGE5 Conduct formal or informal performance evaluation discussions with subordinates.
- 86 MANAGE10 Assign duties to subordinates when a course of action is decided.
- 86 MANAGE8 Formally evaluate the performance of subordinates.
- 85 MANAGE13 Delegate to subordinates.
- 85 MANAGE14 Participate in personal development of subordinates.
- 85 MANAGE7 Monitor and direct day-to-day work of employees.
- 83 MANAGE6 Approve employee actions such as absence, tardiness, pay, vacation, leave, overtime, etc.
- 83 MANAGE12 Assist subordinates in problem solving.
- 82 MANAGE4 Determine specific work procedures for subordinates.

- 82 MANAGE2 Set goals for subordinates.
- 79 MANAGE9 Provide direct, on-the-scene supervision of employees.
- 76 MANAGE11 Consult with subordinates on personal problems.
- 73 MANAGE15 Provide on-the-job training.
- 72 INTER9 Counsel with subordinates on personal problems.
- 67 PLAN3 Schedule the work of others.
- 67 MANAGE16 Orient new employees.
- 65 DM3 Make personnel selection decisions.
- 61 MONIT39 Monitor the efforts or results of other people.
- 54 INTER7 Conduct interviews.
- 54 PLAN11 Plan department practices or procedures.
- 54 MONIT25 Evaluate employee compliance with operating or safety rules.
- 53 MONIT40 Monitor compliance with corporate policy or procedures.
- 50 INTER8 Train others.
- 50 MONIT8 Perform evaluations at the departmental level.
- 48 INTER18 Participate in orientation of new employees.
- 47 PS2 Deal with people problems.
- 46 CONS10 Resolve conflicts between others.
- 45 PS20 Recruit new employees.
- 39 COMM5 Explain Company policies.
- 35 DM2 Make repeated decisions according to predetermined policy or procedure.

Planning, Decision Making, Controlling

- 69 PLAN8 Participate in long-range planning activity.
- 68 DM13 Approve budgets.

- 66 MONIT21 Review and revise budgets and allocations.
- 66 PS32 Determine the allocation of money or other scarce resources.
- 65 PLAN13 Provide input to strategic planning.
- 63 PLAN9 Provide input in business development planning.
- 62 DM9 Approve request to expand resources.
- 61 DM11 Authorize long-term programs and financial commitments.
- 59 MONIT28 Review forecasts.
- 58 CREA7 Develop strategies to maintain or enhance American's financial position.
- 57 PLAN12 Develop strategies to maintain or enhance American's financial position.
- 57 CREA19 Design business systems or strategies.
- 56 MONIT31 Compare actual performance with forecasts, schedules, and/or budgets.
- 56 PLAN18 Plan and anticipate changes in organizational structure.
- 55 PLAN7 Plan policies and programs.
- 53 MONIT17 Set up and monitor internal business controls.
- 53 PS6 Analyze operating performance reports.
- 53 PLAN6 Prepare area budget.
- 52 DM1 Make forecasts and projections as input into planning activities.
- 51 MANAGE1 Lead and conduct staff meetings.
- 50 PLAN14 Provide input to human resources planning.
- 50 COMM6 Prepare and present written goals and plans for operating areas.



- 50 MONIT13 Monitor progress toward goals to maintain managerial control.
- 50 DM12 Approve the introduction of new products, services, or programs.
- 49 DM14 Make decisions regarding the most efficient systems or programs.
- 48 MONIT22 Review and evaluate others' decisions.
- 48 MONIT9 Establish or exercise expense controls.
- 47 DM10 Allocate and schedule resources to ensure their availability when needed.
- 45 DM19 Cancel or discontinue current programs, products or services.
- 45 COMM1 Explain divergence between plans and actual outcomes.
- 45 PLAN4 Prepare plans to meet future requirements.
- 45 DM7 Establish planning guidelines which others must follow.
- 44 MONIT11 Preview proposals for adequacy.
- 43 COMM15 Make presentations to management.
- 42 MONIT34 Assess the efficiency of operations.
- 40 INFL1 Prepare presentations on new ideas or programs to be evaluated by higher level management.
- 39 CONS1 Resolve conflicts among departments and/or operating units.
- 37 PLAN17 Schedule resources to accomplish goals.
- 36 COMM7 Make presentations to the Board of Directors or Corporate officers.
- 34 DM6 Manage stocks, bonds, real estate holdings or other

corporate financial assets.

- 34 DM8 Recommend and/or develop operational policies and procedure
- 33 CONS17 Coordinate interdivisional programs.
- 33 PS3 Participate in emergency action planning.

### Selling and Marketing

- 86 INFL7 Sell company products and/or services.
- 83 INFL8 Use various sales techniques to fit the situation.
- 83 INFL4 Seek out and contact potential customers.
- 80 DM16 Establish sales goals.
- 80 INFL6 Promote the company's products, services, or programs.
- 79 INFL18 Review sales performance records.
- 77 INFL16 Schedule sales calls.
- 75 INFL5 Direct overall day-to-day sale operations in assigned territory.
- 75 INFL10 Entertain others to create a favorable impression of product or service.
- 73 INFL2 Communicate with customers in person or by telephone.
- 73 PS33 Improve sales or profits.
- 73 MONIT29 Review sales performance records.
- 70 CREA2 Develop marketing concepts and strategies.
- 70 CREA20 Develop programs or systems to enhance sales.
- 69 CONS16 Coordinate marketing and sales programs.
- 69 DM4 Price products or services.
- 67 INFL15 Work with sales support systems.
- 65 PS15 Identify or develop new markets for products or services.

- 64 INFL11 Identify and overcome objections to product, service, or program.
- 63 COMM14 Communicate with customers and/or outside suppliers.
- 63 INFL14 Explain in detail features of products or services.
- 62 INFL17 Gain commitment for product, services, or program.
- 59 PLAN15 Participate in market planning.
- 57 COMM19 Write contracts.
- 52 CONS8 Negotiate agreements.
- 52 CREA8 Develop advertising and promotion programs.
- 50 PS10 Evaluate new competitive products.
- 50 INFL12 Ask questions to obtain information and that will help you persuade others.
- 49 INFL3 Write articles for the monthly merchandizing or sales book/publications.
- 40 INTER16 Negotiate with others.
- 39 DM18 Authorize contracts.
- 37 COMM16 Make public speeches.
- 37 INTER2 Entertain visiting dignitaries.
- 33 COMM12 Prepare speeches.
- 31 CONS7 Participate in community-related matters relevant to the business.

#### Interacting with Others

- 54 INTER15 Secure information from others.
- 54 INFL13 Encourage cooperation and openness in others.
- 54 INTER10 Meet with others to solve problems.
- 52 PS30 Read people and respond appropriately.

- 52 INFL9 Persuade others to take action or change their point of view.
- 51 INTER19 Work with others in informal groups.
- 51 CONS19 Locate and provide information to others.
- 51 PS22 Evaluate the relevance or importance of information.
- 49 INTER1 Conduct informal meetings.
- 49 INTER13 Work with others to accomplish a goal.
- 48 CREA18 Develop solutions to unique or non-recurring problems.
- 47 CONS6 Counsel and assist employees not under your direct supervision.
- 46 INTER4 Work with persons from other functional areas.
- 45 PS12 Identify inconsistencies in information.
- 45 DM5 Choose among several courses of action based on obtained information.
- 45 MONIT33 Evaluate the effectiveness of programs and recommend changes.
- 44 CONS14 Give professional advice and specialized assistance.
- 44 COMM17 Communicate with others to inform, instruct, or train.
- 44 INTER11 Conduct formal meetings.
- 44 PS13 Identify the source or cause of problems.
- 44 INTER12 Work with others in a counseling role.
- 43 CREA12 Find new ways of carrying out tasks that improve results.
- 43 PS27 Assemble facts for distribution.
- 42 CONS9 Provide staff advice or assistance to line managers.
- 41 CONS18 Maintain contact with other units, departments, or divisions to keep informed of developments.

- 39 CONS15 Coordinate conferences or meetings.
- 38 PS21 Identify problems requiring immediate attention.
- 38 INTER6 Participate in committee or task force assignments.
- 37 CREA14 Initiate improvement in work method or procedure.
- 37 CREA5 Design or develop training programs.
- 34 CREA13 Make suggestions for improving products, services, or programs.
- 33 PLAN5 Develop detailed courses of action to achieve objectives.
- 32 COMM18 Explain technical material to non-technical audience.
- 31 CONS4 Edit documents or reports prepared by others.
- 30 COMM10 Initiate correspondence or memoranda on an almost daily basis.
- 29 PS1 Adjust schedules to meet emergencies.
- 25 CONS5 Assist in the design and installation of computer based systems.

Engineering, Operations, Production

- 70 MONIT36 Perform engineering evaluation.
- 67 PS7 Read and interpret schematics, blueprints, or other technical drawings.
- 65 CONS13 Provide engineering input to line managers.
- 64 CREA9 Design equipment.
- 62 MONIT37 Prepare purchase requisitions.
- 60 PS25 Requisition materials, equipment, or supplies to meet needs.
- 59 CREA17 Adapt products, procedures, or services to local plant production or use.

- 58 DM17 Requisition materials, equipment or supplies.
- 58 PLAN1 Schedule the availability of material or equipment required to meet objectives.
- 57 CREA10 Design facilities.
- 56 PS31 Solve manufacturing or operational problems.
- 55 MONIT30 Analyze and evaluate processes or equipment designed for effectiveness and cost.
- 52 MONIT10 Inspect new materials or products.
- 52 MONIT6 Ensure that product or service specifications are met.
- 51 PLAN2 Participate in facilities planning.
- 49 PS26 Arrange for the services of outside contractors.
- 48 DM15 Set or approve standard specifications.
- 47 CREA16 Formulate programs to improve technical capability.
- 46 PS8 Find less expensive ways to accomplish goals.
- 45 MONIT1 Perform quality control tests.
- 42 PS11 Evaluate techniques or systems.
- 40 PLAN16 Participate in production planning.
- 38 PS29 Engage in trouble shooting activities.
- 38 DM20 Authorize the release or rejection of product or service.
- 36 CREA15 Recommend changes or revisions of operating procedures.
- 36 INTER3 Work with outside consultants or contractors.
- 34 INTER17 Deal with persons who seek to sell a product, service, or program to American.
- 34 MONIT35 Prepare production records.

#### Research Design and Analysis

- 67 PS14 Interpret research results.

- 59 CREA3 Design methods and procedures for testing products and systems.
- 58 PS4 Identify and state research objectives or problems.
- 56 CREA1 Design experiments, investigations, or studies.
- 54 COMM2 Write technical research or analytical reports.
- 49 PLAN10 Plan the analysis of data.
- 49 CREA11 Create new products or services.
- 46 MONIT14 Collect and prepare information usually in the form of research, reports, and accounts.
- 43 CONS11 Confer with scientific or technical person.
- 42 PS5 Draw conclusions from limited data.
- 42 PS17 Conduct statistical analyses.
- 41 MONIT32 Review published literature.
- 40 PS19 Apply technical knowledge in meeting job objectives.
- 37 CREA6 Design surveys.
- 37 INTER5 Act as project leader.
- 35 COMM9 Write reports summarizing information from various sources.
- 35 CREA4 Develop computer programs.
- 35 PS16 Analyze reports.
- 31 CONS12 Serve as a consultant to other divisions of American.
- 31 COMM8 Write articles for internal publications.
- 19 PS24 Operate electronic data processing equipment.

### Accounting

- 61 MONIT27 Compile financial reports and statements.
- 59 MONIT23 Use accounting procedures.

- 56 MONIT12 Prepare financial statements.
- 55 MONIT19 Do financial audits.
- 51 MONIT18 Examine, analyze, or interpret records.
- 51 MONIT24 Fill out standardized forms or reports.
- 51 MONIT2 Oversee the assessment, remittance, and reporting of revenues due the company.
- 47 MONIT20 Keep detailed and accurate records.
- 41 MONIT5 Deal with the loss of the company's money.
- 40 MONIT16 Maintain proper inventory levels.
- 40 MONIT15 Measure and record output.
- 38 MONIT7 Be concerned with claims for loss, damage or overcharge.
- 35 PS18 Compute costs.
- 34 MONIT3 Initiate documents for corporate transactions.

#### Providing Legal Advice

- 61 CONS3 Provide legal advice to management.
- 60 PS23 Prepare for potential litigation.
- 60 CONS2 Consult with lawyers.
- 51 INTER14 Deal with representatives of local, state, or federal government.
- 47 MONIT38 Monitor compliances with law or government regulations.
- 44 PS9 Manage corporate litigation and judicial proceedings.
- 43 COMM13 Testify in court or other public hearings.
- 40 PS28 Evaluate product, service, or program to ensure it meets government regulations.
- 37 COMM4 Write position papers, policy letters, proposals, etc.
- 36 MONIT4 Audit the effectiveness and impact of services rendered by



external concerns.

- 34 MONIT26 Monitor adherence to procedures set forth in agreements and contracts with external concerns.
- 29 COMM3 Prepare material for inclusion in policy or procedural manuals.
- 24 COMM11 Prepare news releases or other communications to the public.

## APPENDIX C

## Appendix C

## TECHNICAL KNOWLEDGE FACTORS AND ITEMS ON EACH FACTOR

These factors are based on a maximum likelihood factor analysis with varimax rotation. The numbers to the far left of each item are the factor loadings with decimals omitted.

Bio-chemistry/Medical

86 TK44 Chemistry  
83 TK43 Microbiology  
81 TK13 Bio-chemistry  
79 TK29 Industrial health; Medical science; Biology  
78 TK46 Medicine  
77 TK42 Pharmacology  
75 TK48 Clinical research  
58 TK45 Q.C. techniques  
54 TK61 Regulatory affairs  
51 TK19 Sterilization  
45 TK49 Nursing  
32 TK12 Statistics  
29 TK30 Mathematics

Engineering

91 TK25 Engineering, mechanical  
83 TK23 Engineering, electrical  
80 TK24 Engineering, industrial  
75 TK21 Engineering, R & D  
73 TK20 Engineering, civil/structural

- 71 TK22 Engineering, quality
- 65 TK28 Graphic arts; drafting
- 58 TK38 Physics
- 49 TK17 Energy resources; Ecology
- 41 TK53 Management - facilities
- 31 TK5 Printing; photography; audio visual arts

#### Sales and Marketing

- 86 TK58 Management - Sales
- 84 TK54 Management - Marketing
- 78 TK47 Selling techniques
- 70 TK34 Marketing research
- 60 TK56 Management - Product
- 60 TK60 Advertising
- 59 TK4 Pricing (e.g., rates and divisions)
- 37 TK8 Public relations

#### Finance/General Management

- 82 TK36 Accounting
- 77 TK26 Finance; Banking; Taxation
- 70 TK57 Management - Financial
- 60 TK37 Auditing
- 55 TK35 Business planning
- 52 TK50 General business administration
- 43 TK51 Management - General
- 36 TK33 Law
- 33 TK40 International business

Personnel

- 75 TK55 Management - Personnel
- 66 TK3 Psychology; Counseling; Personnel research
- 65 TK31 Industrial relations
- 60 TK63 Compensation
- 48 TK32 Instructional methods; Classroom instruction
- 33 TK27 Government affairs; Civics
- 27 TK65 Creative writing
- 23 TK10 Real estate

Distribution

- 68 TK59 Transportation; Shipping; Receiving
- 66 TK18 Inventory control
- 62 TK9 Purchasing
- 60 TK39 Distribution
- 50 TK11 Customer service
- 49 TK2 Operations
- 38 TK41 Packaging
- 37 TK1 Office management

Production/Manufacturing

- 66 TK52 Management - Production
- 63 TK62 Production planning
- 56 TK64 Good manufacturing procedures

Computers

- 88 TK15 Computer-Hardware
- 82 TK14 Computer-Software

60 TK16 Electronics; Telecommunications

Program Evaluation

83 TK7 Program evaluation

82 TK6 Program development

## APPENDIX D

## Appendix D

## INDIVIDUAL ABILITY FACTORS AND ITEMS ON EACH FACTOR

These results are based on a maximum likelihood factor analysis with promax rotation. The numbers to the far left of each item are the factor loadings with decimals omitted.

Impact-Influence

- 84 IA16 Supervise others
- 80 IA13 Have impact on others
- 71 IA12 Project self-confidence
- 71 IA14 Be tenacious
- 71 IA23 Motivate others
- 69 IA19 Be enthusiastic
- 66 IA9 Train others
- 65 IA20 Remain composed in difficult situations
- 63 IA18 Be persuasive
- 55 IA3 Communicate verbally
- 55 IA21 Make unpopular decisions
- 48 IA15 Be tactful with others
- 37 IA35 Control departments
- 28 IA8 Have positive interpersonal relations

Lead Others

- 95 IA17 Be assertive
- 95 IA37 Lead others
- 85 IA11 Create a good first impression
- 75 IA38 Plan and organize



- 67 IA36 Develop subordinates
- 64 IA10 Delegate
- 51 IA24 Make decisions quickly
- 37 IA22 Listen attentively

### Work Style

- 66 IA34 Work effectively with others
- 63 IA30 Be practical
- 53 IA4 Explain technical material
- 43 IA5 Be creative
- 41 IA6 Communicate in writing
- 41 IA31 Work with little or no direction
- 33 IA28 Be political

### Results Orientation

- 79 IA41 Set high standards
- 64 IA43 Maintain stable performance under pressure
- 60 IA40 Produce results in a timely manner
- 60 IA42 Be thorough
- 49 IA39 Show initiative
- 32 IA32 Work long hours
- 23 IA33 Grasp new ideas quickly

### Speak in Public

- 66 IA1 Speak in public (formal presentation)
- 58 IA2 Sell to the public or customers

Decision Making

67 IA26 Make accurate decisions

54 IA25 Take risks

34 IA27 Be objective

24 IA29 Learn quickly

## APPROVAL SHEET

The dissertation submitted by Patrick Calby has been read and approved by the following committee:

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The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the Committee with reference to content and form.

The dissertation is therefore accepted in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

Apr. 18 1984  
Date

Homer H. Johnson Ph.D.  
Director's Signature