CRITIQUES OF JOB ANALYSIS METHODS

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HUMAN RESOURCES IN CRIMINAL JUSTICE

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PREFACE

As with all projects as ambitious as this one, a host of persons contributed to the conception, planning, and implementation of the studies. The initial acknowledgment must go to Price Foster. Perhaps ten years ago he recognized the need for this work and maintained an interest and commitment until he was in a position to put together resources from LEAA and three universities to attempt an intensive, multifaceted study of manpower and human resources in the criminal justice system. The support and coordination of Jean Moore of OCJET throughout the project is recognized and appreciated, as is the assistance of George Datesman in the initial stages of the project.

We would like to mention members of the two companion projects with whom we have worked closely: John Hudzik and Tim Bynum of Michigan State University; and Vic Strecher, Larry Johnson, and Larry Hoover of Sam Houston State University.

Finally, we would like to identify and cite the contributions of each member of the project staff. Inevitably, however, the individual contributions of 16 professional persons to conceptualizing, leading, planning, implementing, collecting data, analyzing, managing, writing, and editing have been appropriately lost in an amalgam representing a joint effort of many people. While the principal investigators must take ultimate responsibility for the final report, all members of the professional staff, to various

degrees, must share in whatever contribution the project may have made to human resources issues in criminal justice.

In terms of the final preparation of this volume, appreciation is expressed to Ed Levine, Lewis Bowman, and Susan Hensley for their organizational and editorial assistance, and the contributions of particular persons to specific sections of this report are acknowledged as follows:

Chapter 2. Ronald A. Ash and Edward L. Levine,

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Chapter 7. Jonathan M. Canger and Susan E. Hensley.

EXECUTIVE SUMMARY

This is the Final Report for Grant 78-CD-AX-0003 funded by the Office of Criminal Justice Education and Training of the Law Enforcement Assistance Administration. The report is composed of four volumes.

HUMAN RESOURCES IN CRIMINAL JUSTICE:

VOLUME I.	METHODS FOR HUMAN RESOURCES IN THE CRIMINAL JUSTICE SYSTEM: A FEASIBILITY STUDY
VOLUME II.	CRITIQUES OF JOB ANALYSIS METHODS
VOLUME III.	REVIEWS OF JOB-RELATED HUMAN RESOURCES PROCESSES
VOLUME IV.	APPENDIX: SELECTED SUMMARIES OF HUMAN RESOURCES STUDIES IN CRIMINAL JUSTICE

The general purpose of this project was to assess the feasibility of transporting human resources methods developed in the private sector to problems in the criminal justice system. The principal methods and procedures of this project were:

1. review of technical literature on methods of human resources planning, development, and utilization;
2. review of studies on the use of human resources methods in criminal justice;
3. interviews with key criminal justice officials regarding current practice and issues and problems in human resources;
4. critical analysis of job-related human resources methods;
5. evaluation of contemporary job-analysis and job-related methods in the context of current human resources practices in criminal justice organizations.

Since this was a feasibility and developmental project, the major products are not general findings, but the detailed explications of the methods for human resources planning, development, and utilization and the considerations for their transfer to the criminal justice system. However, the following general findings may be stated:

1. It is feasible to transfer human resources methods constructed for use in various areas of the criminal justice system, provided that certain modifications are made and that rational choices of methods are made on criteria of use and practicality.

2. Criminal justice organizations need to increase their efforts and upgrade their sophistication in the use of human resources methods in order to keep pace with organizational and environmental changes and increasing pressures for public accountability and legal compliance.

3. It is appropriate to standardize human resources planning, development, and utilization methods, but not appropriate to standardize specific jobs and many organizational practices, unless consideration is given to organizational and environmental variations.

4. A multimethodological, hybrid job-analysis technique is needed to support job-related human resources activities in criminal justice organizations, which is flexible enough to accommodate the desired uses and practicalities of individual organizations.

This volume reviews, evaluates, and compares the major methods of job analysis. Job analysis was selected as the demonstration methodology in considering the feasibility of the transfer and adaptation of human resources methods to the criminal justice system. Not only does this volume serve its primary purpose of support for the overall project, but it also stands by itself as a contribution to knowledge in human resources methods.

The principal methods evaluated in this volume are:

1. Functional Job Analysis,
2. Task Analysis,
3. Ability Requirements Scales,
4. Critical Incident Technique,
5. Position Analysis Questionnaire,
6. Job Element Method.

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Chapter 1

INTRODUCTION

This is the second volume of the Final Report for Grant Number 78-CD-AX-0003, "Methodologies for Manpower Analysis and Planning in the Criminal Justice System: A Feasibility Study." This volume represents part of the literature research efforts undertaken to fulfill one of the major goals of this project--to assess the feasibility of applying or adapting job-based methodologies to human resources problems in the criminal justice system. It begins with a discussion of the uses for job analysis information, followed by critiques of selected job analysis methods. The focus on job analysis methodologies was based on the consideration that information from job analysis serves as a basis for many of the other HRPDU functions. The specific uses for job analysis information are described in the first section. This paper should be especially useful for administrators since, in addition to suggesting possible applications for job analysis information, a framework is provided to evaluate the potential usefulness of various methods for particular situations.

The next five papers critique the major job analysis methods used by professionals in and outside the criminal justice system. The first of these five is a discussion of work-oriented job analysis methods.

The methods are differentiated from worker-oriented methods in that the latter focus on the human attributes necessary to perform the job while the former describe observable tasks and activities performed on the job.

The next paper is a review of the Ability Requirements Scales which were developed by Fleishman as a framework for classifying tasks according to specific human ability requirements. In this paper are described the individual scales as well as uses for various human resources activities.

In the paper reviewing the Critical Incident Technique, the data collection method is described and the advantages and disadvantages of the approach are discussed. In addition, three of the most widely used applications of the technique--performance evaluation, training and selection--are considered.

In the next paper another job analysis technique is examined which is worker-oriented rather than work-oriented. The Position Analysis Questionnaire is a structured job analysis questionnaire which produces a series of job elements describing behaviors involved in the performance of a job. After discussion of the method, advantages and disadvantages and some of the uses for this method of job analysis are presented.

The final paper in this volume reviews the Job Element Method of job analysis developed by Primoff. This technique is also a worker-oriented approach in that it analyzes jobs in terms of human attributes

necessary for superior performance. This paper includes a description of the data collection method and a discussion of uses for the results, the advantages and disadvantages of the approach, and the availability of training for job analysts interested in using the job element method.

Chapter 2

UTILIZATION AND CHOICE OF JOB ANALYSIS METHODS

Contents

Introduction

Job analysis information can be used for a variety of purposes. Kershner (1955) put it this way: ". . . job analysis has been a sort of handmaiden serving in various ways a variety of needs and all the while floundering in a morass of semantic confusion." As the potential usefulness of job-related information becomes increasingly apparent, personnel managers and administrators are faced with decisions regarding the particular types and methods of job analysis to select for use in their respective organizations.

One consideration in choosing among job analysis methodologies is the purpose for which one intends to use the job-related information. Wilson (1974) emphasizes that the purpose(s) for which job analysis is conducted should determine the type of information collected and how it is documented. Thus, the selection of a particular job analysis method is primarily a situation-specific consideration.

A second consideration is situation-specific practicality. What resources do <u>you</u> have for job analysis activities? How many respondents or sources of job information are available for the job classifications requiring analysis in <u>your</u> organization? What is <u>your</u> time frame? What types of data collection methods and result formats are acceptable to <u>your</u> respondents and management?

The purpose of this paper is to suggest a framework within which the personnel manager or administrator can evaluate the potential usefulness of job analysis methods for the particular situation. To aid the manager in determining the role(s) or purpose(s) of job analysis in his organization, a comprehensive and carefully defined list of uses for job analysis information is proposed. To aid in the determination of practicality, ten evaluative factors are suggested. Eight of these are adapted from the work of Brumback, Romashko, Hahn, and Fleishman (1974), and, in addition, cost and quality considerations are taken into account. Finally, in the concluding section of this article a research study is proposed which could yield valuable information on the prevailing views about job analysis methods within the evaluative framework.

Uses of Job Analysis Information

The job analysis literature contains numerous and varied lists of uses or proposed uses for job analysis information. Zerga (1943) concludes that there are approximately 20 uses; Wilson (1974) lists 13; Christal (1974) lists eight; Rouleau and Krain (1975) identify seven; and Dunnette and Borman (1979) identify five. Shorter lists, each containing four uses, are proposed by Lawshe and Satter (1944), Gagne (1963), and Prien and Ronan (1971). McCormick (1976) identifies 17 uses within five frames of reference, indicating that the particular frame of reference determines the use of job-related information. These various lists are shown in Table 1.

Table 1

Lists of Uses of Job Analysis Information

Zerga, 1943

1. Job grading and classification
2. Wage setting and standardization
3. Provision of hiring specifications
4. Clarification of job duties and responsibilities
5. Transfer and promotions
6. Adjustment of grievances
7. Establishment of a common understanding between various levels of workers and management
8. Defining and outlining promotional steps
9. Investigating accidents
10. Indicating faulty work procedures or duplication of effort.
11. Maintaining, operating and adjusting machinery
12. Time and motion studies
13. Defining limits of authority
14. Indicating cases of individual merit
15. Indicating causes of personal failure
16. Education and training
17. Facilitating job placement
18. Studies of health and fatigue
19. Scientific guidance
20. Determining jobs suitable for occupational therapy

Prien and Ronan, 1971

1. Performance description and evaluation
2. Selection
3. Training
4. Organizational studies

Dunnette and Borman, 1979

1. Objective job description
2. Inference of job-related personal attributes
3. Developing job related selection procedures
4. Improvement of matches between people and jobs
5. Designing job-related training and orientation programs

Wilson, 1974

1. Job restructuring
2. Training program development
3. Qualifications and standards development
4. Test development
5. Performance evaluation
6. Preparation of accurate job descriptions
7. Employee counseling
8. Identification of safety hazards
9. Wage and salary administration
10. Job development for disadvantaged and handicapped
11. Affirmative Action Program Planning and Implementation
12. Manpower planning
13. Establishment of management information systems

Rouleau and Krain, 1975

1. Classification
2. Compensation
3. Job restructuring
4. Placement
5. Training
6. Defining the nature of supervision
7. Performance appraisal

Lawshe and Satter, 1944

1. Derivation of training content
2. Setting up of personnel specifications.
3. Improvement of job efficiency
4. Establishment of wage structure

Gagne, 1963

1. Identification of job families (job classification)
2. Defining education and training objectives
3. Designing training and instructional methods.
4. Performance measures

Christal, 1974

1. Defining work performed by personnel
2. Job evaluation (for grade, pay, and skill levels)
3. Job structures (job engineering, work organization, and occupational classification.)
4. Job requirements
5. Career development
6. Personnel utilization
7. Job satisfaction
8. Performance evaluation (at the task level)

McCormick, 1976

Individual

1. Vocational guidance
2. Vocational preparation

Organization

3. Manpower planning
4. Job Design
5. Job evaluation
6. Recruiting
7. Selection and placement
8. Training
9. Personnel appraisal

Labor Relations

10. Management-union relations

Public Policy and Administration

11. Legal aspects: standards, licensing, certification, etc.
12. Public employment services
13. Public training and education programs.
14. Social security administration
15. Safety programs

Research Objectives

16. Population analysis (economic, social, etc.)
17. Behavioral research related to job or occupational characteristics

Considering the job analysis uses identified by the authors mentioned above, and tempering these with a measure of practical experience, yet another list of uses is now proposed. It is intended to capture the essential elements of the other lists in Table 1, while maintaining a reasonable degree of brevity. A definition for each use has been provided in an attempt to minimize semantic confusion.

Job Description

A complete job description should contain job identification information, a job summary, the job duties, accountabilities, and job specification or employment standards information (Henderson, 1975). Job identification information includes the job title, job code (if any), status (exempt or nonexempt), effective date written or revised, the location of the job (by site, division, department, section, etc.), title of the immediate supervisor, pay grade/level and pay range, the signature of the person preparing the job description, and the signature(s) of the person(s) approving it. The job summary is a brief, narrative picture of the job that highlights its general characteristics and identifies its major functions and activities. Job duty statements specify activities that must be accomplished in the performance of the job. Accountabilities statements specify the major end results achieved when the job duties are performed satisfactorily. Job specifications/employment standards specify the human qualities necessary to perform the job, usually in terms of knowledges, skills, abilities, aptitudes, attributes, states, etc.

Job Classification

Job classification is the arrangement of jobs into classes, groups, or families according to some systematic schema. Some traditional classification schemes have been based on organizational lines of authority, technology-based job/task content, and human behavior-based job content.

Job Evaluation

The basic objective of job evaluation is the "correct" slotting of jobs in terms of their relative worth both within an organization and within the related labor market. Traditional job evaluation systems differ in terms of the basis of evaluation (i.e., individual job factors versus the job as an entity) and the method of evaluation (i.e., comparison with defined standards versus comparison with other jobs) (McCormick, 1976).

Job Design/Restructuring

Job design deals with the allocation and arrangement of organizational work activities and tasks into sets. A singular set constitutes a "job," and is performed by the job incumbent. Job restructuring or redesign consists of reallocation/rearrangement of the work activities into different sets. From an industrial engineering perspective, Davis (1961) indicates that approaches to job design can be characterized as: (1) process-centered or equipment-centered (jobs designed by specializing activities or functions to determine

minimum production time); (2) worker-centered (particular emphasis placed on designing jobs so as to enhance worker motivation and job satisfaction); and (3) a combination of these two. After an extensive review of the job analysis literature, Prien and Ronan (1971) observed that the arrangement of work activities into jobs is largely a function of customs and convention, local option, extra tasks to be done, and simply accidents of the moment.

Personnel Requirements/Specifications

Personnel requirements and specifications for a particular job (for acquisition and deployment including recruitment, selection, and placement) should set forth the personal knowledges, skills, aptitudes, attributes, traits, etc. that are related to successful performance of that job. Certain specifications may be identified as "minimum qualifications," or those person requirements that are the lowest acceptable. Other specifications may be considered "desirable" rather than "essential" and the degree of desirability may vary. Requirements/specifications can take a variety of forms, including type and amount of work experience, type and amount of education, type and amount of specific life experiences, achievement of specified score levels or profile matches on tests and inventories (job knowledge, aptitude, personality), specified levels of proficiency on skills tests and work samples, and physical requirements. Traditionally, requirements/specifications have been established judgmentally, or on the basis of statistically validated relationships between predictors and measures of job success.

Performance Appraisal

Performance appraisal is (or should be) a systematic evaluation of personnel by their supervisors or others who are familiar with their performance. Its principal purpose is describing performance strengths and weaknesses within and between workers (Landy and Trumbo, 1976). Factors or dimensions forming the basis for the performance appraisal or evaluation should be job related and therefore relevant to an important goal of the organization. A good performance appraisal system should also provide the individual worker with knowledge about his/her job-related strengths and weaknesses.

Worker Training

Training should be a systematic, intentional process of influencing behavior of organizational members such that their resultant behavior contributes to organizational effectiveness. The term behavior includes any aspect of human activity, cognition, or feeling directed toward the accomplishment of work tasks. Training is looked upon primarily as a tool which assists in the accomplishment of organizational goals and the goods and/or services with increased efficiency. However, goals of the organization and developmental goals of the individual can be in close harmony in training (Hinrichs, 1976; McGehee and Thayer, 1961; Patten, 1971).

Worker Mobility

Worker mobility (career development, career lattices) is the movement

of individuals into and out of positions, jobs, and occupations. From the perspective of the individual, both self-concepts and social situations change, making the process of job/occupational choice continuous due to growth, exploration, establishment, maintenance, and decline (Brammer and Shostrom, 1968; Super, 1951). Organizations often find it advantageous to participate in the worker mobility process (the interaction of personal factors and opportunities) through establishment of formal career lattices and career counseling/development programs, based on carefully delineated job information.

Efficiency/Safety

Improving efficiency and safety in jobs involves the development of work processes with particular reference to the work activities of people, including work procedures, work layout, and work standards. The proper design of equipment and other physical facilities is also involved.

Manpower/Workforce Planning

Manpower/workforce planning (projection, skillsbanking, worker profiles by job/task) includes anticipatory and reactive activities by which an organization ensures that it has the right number and kind of people at the right places, at the right times, performing jobs which maximize both the service objectives and/or profit of the organization (cf. Patten, 1971). It also includes the activities by which an organization enhances the self-actualization and growth needs of its people

and allows for the maximum utilization of their particular skills and talents.

Legal/Quasi-Legal Requirements

Legal requirements refer to obligations imposed by legislative bodies or courts. Quasi-legal requirements refer to regulations or quidelines established by government agencies (e.g., EEOC, OFCC, OSHA) or agreements with industrial or craft unions and similar groups or organizations. Generally, the nature of the particular legal or quasi-legal requirements that job analysis would help an organization to meet is directly related to one or more of the 10 job analysis uses listed above.

These uses for job analysis are not mutually exclusive or independent by any means. Job classification and job evaluation are often interwoven. If the goal of a job analysis is a thorough job description, a number of other uses come into play including job classification, job evaluation, personnel requirements/specifications, and aspects related to performance appraisal. Career counseling aspects of worker mobility would be almost impossible without job descriptions. Manpower/workforce planning encompasses virtually every job analysis use listed.

Evaluative Factors for Situation-Specificity Practicality

Consideration should be given to the several dimensions that might be used to evaluate the various job analysis methods that are currently

available. In a study using five job analysis methods to analyze three jobs, Brumback, et al. (1974) offered tentative, experiential evaluations of the methods on 13 factors. Eight of these factors have been selected for adaptation and inclusion in the framework for evaluating situation-specific practicality of job analysis methods, and are explained below. Two other factors, cost of applying a method and quality of outcome, are also included:

1. Operational Status--has the method been tested and refined enough to be considered ready for use in its current form?

2. Off-the-Shelf Availability--is the method ready to use or must it first be redesigned and constructed; i.e., tailored to the particular job?

3. Occupational Versatility/Suitability--is the method suitable for analyzing a variety of jobs, or at least the types of jobs one desires to analyze?

4. Standardization--is the method capable of yielding norms, thus allowing the comparison of data obtained from different sources of information at different times?

5. Respondent/User Acceptability--is the method, including its various reporting/information gathering requirements and results format, acceptable to the job analysis respondents and users?

6. Amount/Availability of Job Analyst Training--how much training is required for job analysts to be able to use the method independently, and how readily available is the training?

7. Sample Size-- how many respondents or sources of information does the method require in order to ensure adequately dependable data?

8. Reliability--will the method yield similar results upon repetition?

9. Cost--what is the estimated cost of the method? The cost would include cost of materials, required training, consul-

tative assistance, and person-hours times salary for job analysts, respondents, and clerical support.

10. Quality of Outcome--will a particular method generally produce high quality outcomes (e.g., legally justifiable, valid exams; effective training programs) relative to other methods?

A Framework for Evaluating the Potential Usefulness of Job Analysis Methods

The proposed framework involves consideration of purpose and practicality. First, decisions must be made as to what purpose(s) the job analysis is intended to serve in the organization. A check-list or shopping list approach is probably best. The decision-maker would indicate which of the 11 purposes (see Table 2) are relevant to the job analysis objectives of the organization. In the event that the necessity for trade-offs is anticipated, it may be desirable to indicate the relative importance of the purposes chosen.

Next, various job analysis methods would be examined with regard to how well each is suited to the purposes identified. If one method appears to be superior for most or all the relevant purposes, that method certainly deserves primary consideration. A more likely finding would be different methods emerging as "better" for different purposes. In this latter instance, an optimal multimethodological approach might be identified.

The results for considerations of purpose must be tempered with considerations of practicality. The optimal method or combination of methods from a purpose perspective may be prohibitive in terms of cost.

Table 2

Proposed Framework for Evaluating the Potential Usefulness of Job Analysis Methods

		Method 1	Method 2	Method 3	Method n
I.	"Purpose" Considerations of Job Analysis in This Organization. (Check all that apply or supply relative weights.)				
_____	Job Description				
_____	Job Classification				
_____	Job Evaluation				
_____	Job Design/Restructuring				
_____	Personnel Requirements/ Specifications				
_____	Performance Appraisal				
_____	Worker Training				
_____	Worker Mobility				
_____	Efficiency/Safety				
_____	Manpower/Workforce Planning				
_____	Legal/Quasi-Legal Requirements				
II.	"Practicality" Considerations of Job Analysis in This Organization. (Check all that apply or supply relative weights.)				
_____	Operational Status				
_____	Off-the-Shelf Availability				
_____	Occupational Versatility/Suitability				
_____	Standardization				
_____	Respondent/User Acceptability				
_____	Amount/Availability of Job Analyst Training				
_____	Sample Size				
_____	Reliability				
_____	Cost				
_____	Quality				

Time constraints may dictate a strictly off-the-shelf technique; or, the number of respondents available may be so small as to rule out methods requiring a substantial sample.

Ideally, the decision as to which job analysis method(s) to use should be based primarily on the purposes for which the organization needs to conduct job analysis. Realistically, the practicality considerations are likely to play an equally important part in the decision, especially in the case of smaller organizations with limited resources. In either case, use of the proposed framework in selecting a job analysis methodology would help ensure that all relevant information has been considered in making the selection. If a "satisficing" strategy is necessary, management has an indication in advance as to where the weak links are, and why they are there.

Unfortunately, the proposed framework cannot be considered fully operational now. This is because there has been very little scientific research which compares various job analysis methods on dimensions of uses, costs, and outcomes (Prien and Ronan, 1971). The primary comparative focus of the single experimental study of which the authors are aware is on the application of job analysis for personnel selection purposes (Levine, Bennett, and Ash, 1977). Other comparative studies are experience-based accounts (Brumback, et al., 1974; Hollenbeck and Borman, 1976). Although the framework could be used by individual practitioners, its value would be limited to the extent that the practitioner's experience with a variety of methods is limited.

Thus, one is in the rather frustrating position of having a basis for evaluating the potential usefulness of various job analysis methods, but lacking a scientifically developed data base from which to make these evaluations. Such a data base would take considerable time and resources to develop. However, there is a mid-range strategy between the alternatives of experiential anecdotes and opinions of individual personnel analysts on the one hand and the scientific approach on the other. The first step in the mid-range strategy would be a thorough review of the job analysis literature, focusing on the various methods of job analysis. Such a review has been conducted as part of the current grant project activities, and tentative notions have been formed about the utility of the major methods of job analysis for each of the eleven uses presented here. As a second step in the strategy, a survey will be conducted (second phase of project) of expert job analysis users in order to gather systematically their opinions on the subject.

The systematic synthesis of these expert opinions will be used to operationalize the framework presented here on an interim basis. The advantages of the pooled experiences of many professionals who have used more than one method for at least two different job classes should be obvious. By means of the survey results, each job analysis method will be assigned a "relative utility value" for each purpose listed in Table 2. The methods will also be evaluated in terms of the practicality considerations across a wide variety of situations.

The operationalized framework could then be easily adapted to the particular circumstances of an organization. Thus, the framework should be a valuable tool for managerial decision-makers charged with the responsibility of choosing a job analysis approach for their organizations. Over the long haul, an even more valuable framework could be built around a programmatic series of experiments designed to evaluate various methods of job analysis in terms of both purpose and practicality considerations.

References

Brammer, L. M., & Shostrom, E. L. Therapeutic psychology: Fundamentals of actualization counseling and psychotherapy. Englewood Cliffs, New Jersey: Prentice-Hall, 1968.

Brumback, G. B., Romashko, T., Hahn, C. P., & Fleishman, E. A. Model procedures for job analysis, test development, and validation. Volume I: Final report of the first phase. Washington, D. C.: American Institutes for Research, AIR-376004/74-FR, July, 1974.

Christal, R. E. The United States Air Force occupational research project. (AFHRL-TR-73-75) Lackland Air Force Base, Texas: Air Force Human Resources Laboratory, 1974. JSAS Catalog of Selected Documents in Psychology, 1974, 4, 61. (Ms. No. 651)

Davis, L. E. The concept of job design and its status in industrial engineering. In Symposium on human factors in job design. American Psychological Association, Santa Monica, California: Systems Development Corporation, Report SP-611, November, 1961.

Dunnette, M. D., & Borman, W. C. Personnel selection and classification systems. In M. R. Rosenzweig and L. W. Porter (Eds.) Annual Review of Psychology. Palo Alto, California: Annual Reviews, Inc., 1979.

Gagne, R. Task analysis and the establishment of human performance. American Psychological Association, Philadelphia, Pennsylvania: 1963.

Henderson, R. I. Job descriptions--critical documents, versatile tools. New York: AMACOM, 1975.

Hinrichs, J. R. Personnel training. In M.D. Dunnette (Ed.) Handbook of industrial and organizational psychology. Chicago: Rand McNally, 1976.

Hollenbeck, G. P., & Borman, W. C. Two analyses in search of a job: The implications of different job analysis approaches. Paper presented at the 84th Annual convention of the American Psychological Association, Washington, D. C., 1976.

Kershner, A. M. A report on job analysis. Washington, D. C.: Office of Navel Research, ONR Report ACR-5, 1955.

Landy, F. J., & Trumbo, D. A. Psychology of work behavior. Homewood, Illinois: Dorsey Press, 1976.

Lawshe, C. H., Jr., & Satter, G. A. Studies in job evaluation: I. Factor analysis of point ratings for hourly paid jobs in three industrial plants. Journal of Applied Psychology, 1944, 23, 189-198.

Levine, E. L., Bennett, L. J., & Ash, R. A. Exploratory comparative study of four job analysis methods. (Selection Resource Center Research Report No. 20) Phoenix: State of Arizona Department of Administration, Personnel Division, February, 1977.

McCormick, E. J. Job and task analysis. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology. Rand McNally College Publishing Company, 1976.

McGehee, W., & Thayer, P. W. Training in business and industry. New York: Wiley, 1961.

Patten, T. H., Jr. Manpower planning and the development of human resources. New York: Wiley & Sons, 1971.

Prien, E. P., & Ronan, W. W. Job analysis: A review of research findings. Personnel Psychology, 1971, 24, 371-396.

Rouleau, E. J., & Krain, B. F. Using job analysis to design selection procedures. Public Personnel Management, 1975, 4, 300-304.

Super, D. E. Vocational adjustment: Implementing a self concept. Occupations, 1951, 30, 88-92.

Wilson, M. Job analysis for human resources management: A review of selected research and development. (Manpower Research Monograph No. 36). Washington, D. C.: U. S. Department of Labor, 1974.

Zerga, J. E. Job analysis: A resume and bibliography. Journal of Applied Psychology, 1943, 27, 249-267.

Chapter 3

REVIEW OF WORK-ORIENTED JOB ANALYSIS METHODS: FUNCTIONAL JOB ANALYSIS, TASK ANALYSIS, AND RELATED TECHNIQUES

Contents

Introduction

This paper is designed to introduce administrators, personnel managers, and planners in the Criminal Justice System to various forms of work-oriented job analysis. Although it is impossible to present a complete treatment of the subject in a short introductory document, it is hoped that this summary will provide sufficient information to assess the possibilities for use of the methods described, and to guide those interested to sources of additional information and training.

This treatment of work-oriented job analysis will consist of four major areas: (1) description of work-oriented job analysis; (2) uses of work-oriented job analysis methods; (3) advantages and disadvantages of the approach; and (4) training available in work-oriented methods.

The first part will be a general description of work-oriented job analysis. This section will contain subsections on (1) the differences between worker-oriented and work-oriented job analysis methods, (2) definition of the term "task," (3) arguments for and against analyzing jobs into tasks, (4) methods for collecting work-oriented job analysis information, (5) the types of scales that can be used for analyzing tasks, (6) data analysis and reporting of task information, (7) identification of worker attributes needed to perform tasks in a given job, (8) verification of information generated from the work-oriented job analysis methods, and (9) descriptions of some specific work-oriented job analysis methods.

The second section will describe the various applications for work-oriented job analysis. Selected examples from the Criminal Justice System will be given.

In the third section advantages and disadvantages of work-oriented job analysis methods as opposed to other methods will be discussed. Several work-oriented methods will also be compared.

Then, in the final section, some comments will be made concerning available training for various work-oriented job analysis methods.

Description

Work-Oriented Job Analysis vs. Worker-Oriented Job Analysis

Jobs may be analyzed through the use of worker-oriented or work-oriented information. A worker-oriented approach looks at the human attributes required to perform a job, or the behaviors required of the worker. The outcomes of some forms of worker-oriented job analysis such as Job Elements (Primoff, 1975) are in the form of the knowledges, skills, abilities, and other characteristics (KSAO's) the worker has, and how important these KSAO's are for job performance. Another well-known worker-oriented technique is the Position Analysis Questionnaire (PAQ) (McCormick, Jeanneret, and Mecham, 1972). The PAQ deals with the worker's information-receiving and processing activities, along with worker responses called for by the job.

By contrast, work-oriented job analysis is concerned with what gets

done on the job, along with the methods and the materials or equipment used (McCormick, 1976). Its primary outcome is a description of the observable tasks, duties, and/or activities which are performed on the job. However, work-oriented job analysis methods usually do not stop with a description of what gets done; they also include a set of ratings on various components of the job. Aspects of tasks, or activities which can be rated, include: the amount of time it takes to do the task, task difficulty, and importance of the activity to the total job. In addition, work-oriented methods deal with human attributes needed for task performance; but, this happens only after the job has been broken down into tasks, and these tasks have been rated or evaluated in some way.

In this paper, the main interest will be in work-oriented forms of job analysis. The crux of all work-oriented job analysis techniques is the task. What is a task? The answer to this question depends on the particular method used in the job analysis.

What is a Task?

Tasks in Functional Job Analysis. Of all the work-oriented job analysis methods, Functional Job Analysis (FJA) provides the most carefully delineated definition of a task. The Handbook for Analyzing Jobs (U.S. Department of Labor, 1972, p. 3; see also Fine and Wiley, 1971) defines a task as follows:

> "...task is one or more elements and is one of the distinct activities that constitute logical and

> necessary steps in the performance of work by the worker. A task is created whenever human effort, physical or mental, is exerted to accomplish a specific purpose." (Emphasis in original.)

A task in FJA can be thought of as an effort directed towards a goal. Descriptions of tasks performed should include what the worker does and the results of the actions he or she takes. The language to be used for task statements is very clearly specified. Machines, tools, equipment, work aids, materials, products and services used, as well as requirements made of the worker, should be listed in the task statement. Moreover, the way the task relates to Data, People, and Things is measured. An example of the description of one task for the job of "dough mixer" is given in the Handbook for Analyzing Jobs.

> "Dumps ingredients into mixing machine (the activity). Examines production schedule (Data) to determine what type of bread is to be produced, such as rye, whole wheat, or white. Refers to formula card (Data) for quantities and types of ingredients required, such as flour, water, milk, vitamin solutions, and shortening. Weighs out, measures, and dumps ingredients into mixing machine (Things). (20%)" (p. 44, Emphasis added.)

The precentage in parentheses gives the percentage of total time the worker devotes to this task. For this particular task, the worker deals only with Data and Things. But for most tasks, there will be at least some involvement with each of the three aspects (Data, People, and Things) that activities can be related to.

Tasks in Task Inventories. Task Inventories are questionnaires used to gather information about job components. Tasks in a typical inventory are not nearly as carefully worded as tasks in FJA. Task inventories

usually give no information about the circumstances surrounding the activity. Whereas a task description in FJA is designed to give a wealth of information concerning the "what," and "how," and "why" of the activity, a task inventory gives minimum information on these aspects.

Some examples from a task inventory used for analyzing the job of Police Officer in the Minneapolis/St. Paul Metropolitan area are given below:

--"Patrol Residential Area by Auto"

--"Maintain Stationary/Moving Radar Unit"

--"Handle Report of Fighting, Disorderly Conduct"

(Metropolitan Council, 1978). These activities were rated according to their frequency, time per occurrence, and percent of total work time. As in most typical task inventories, no information about the situation surrounding the activity was given.

Tasks in Guidelines Oriented Job Analysis (GOJA). Another work-oriented method of job analysis, Guidelines Oriented Job Analysis (GOJA) (Biddle, 1977), does not use the word "task" in explaining how to do a work-oriented job analysis. The name of this technique is meant to convey that it is designed to respond specifically to requirements in the EEOC guidelines. The term "duty" comes closest to what might be thought of as a task. The instructions for this technique lay out guidelines for writing a job's duties:

"·A duty is one major piece or part of your job

·A duty is an action you take or a responsibility you have...

·A duty can be many similar tasks written into one statement...

·A duty can be a description of several steps you take in a process." (p. 9)

The use of the word "tasks" in the third guideline is not clearly defined. It is assumed that Biddle uses the terms "task" and "duty" interchangeably. Probably the clearest definition given for task or duty in GOJA is the description of what a good duty statement should contain:

> "A good duty statement, then, tells what is done, how and why it is done, and includes some examples to help explain the duty." (p. 13, emphasis in the original.)

This suggests that the GOJA task is similar to the FJA task, with the exception of the specific language requirements in FJA.

Other work-oriented methods (e.g., U.S. Civil Service Commission, 1975; Iowa Merit Employment Department, 1974) are vague in formally defining a task. A task is usually defined as something the worker does, or actions taken by the worker. However, the State of Iowa, in its Job Analysis Guidelines, (Iowa Merit Employment Department, 1974) does explain that a task statement should tell who performs the action, as well as who or what is affected by it. The purpose and procedures for the activity should also be stated.

To summarize, the definition of the term "task" depends on the method of work-oriented job analysis being used. Although most

methods give at least an implied definition of what a task is, some leave task parameters almost totally undefined. However, the common elements in all definitions of the term task are that the task is viewed as a subdivision of a job, and is concerned with what gets done on the job.

Must We Analyze a Job Into Tasks?

Do we need to analyze a job into smaller elements? Obviously, those who developed the various job analysis methods cited above would emphatically answer that a job can be analyzed into tasks. However, it is not clear that a job must be analyzed into tasks. What are some of the prevailing views on this issue?

Many of the arguments for and against analyzing jobs into tasks have been made only from the point of view of personnel selection. For example, Schmidt, Hunter, Pearlman, and Shane (1979) argue that Knowledges, Skills, Abilities, and Other Characteristics (KSAO's) may not differ substantially across situations or jobs. This suggests that it would be more cost-effective to test directly for KSAO's instead of doing task analysis for making selection decisions. Also in the area of selection, Prien (1977) argues that worker-oriented methods are more adaptable to test construction than are task-based analyses. This is because worker-oriented methods lead more directly to the KSAO's needed to perform the job, and these KSAO's translate directly into tests required. Likewise, Levine, Bennett, and Ash (1977) found that other

methods of job analysis resulted in examination plans for the purpose of employee selection which were equal or superior to the examination plan resulting from task analysis.

McCormick, who devised the Position Analysis Questionnaire (PAQ) (McCormick, Jeanneret, and Mecham, 1972) uses this worker-oriented job analysis technique for selection, classification, and job evaluation. Another non-task based job analysis tool, Job Elements (Primoff, 1975), can be used for the purpose of selection. Both Primoff and McCormick point out, however, that the task is indispensable when the purpose of the analysis is job description (McCormick, Mecham, and Jeanneret, 1977; Primoff, 1975).

Brumback (1976) thinks that analyzing jobs into tasks is necessary, at least for some purposes. He argues that no one method of job analysis is good for every purpose. The main use for task statements and associated frequency data, according to Brumback (1976), is to be in compliance with the content validation strategy described in the legal guidelines on employee selection procedures, the most recent version of which is the Uniform Guidelines on Employee Selection Procedures (Equal Employment Opportunity Commission, U.S. Civil Service Commission, U.S. Department of Labor, and U. S. Department of Justice, 1978). Rouleau and Krain (1975) are even more emphatic in their support of analysis of jobs into tasks. They stress that a minimum requirement for job analysis to be used for selection is the statement of the major job duties in order of importance to job success and frequency or their performance on a job. The widely

used Dictionary of Occupational Titles (U.S. Department of Labor, 1977) also is in favor of the analysis of jobs into tasks. This book of job descriptions uses tasks throughout as a way to communicate the essence of jobs.

Most authorities argue for analyzing jobs into tasks, at least for some purposes. Most arguments against work-oriented job analysis are based on the adequacy of other methods of job analysis, namely worker-oriented methods. But tasks are necessary in writing job descriptions, and in content validation of examinations. Since both of these applications are widespread, it can be said that at least for the time being it is necessary to analyze a job into tasks. Moreover, it is difficult to conceive of designing jobs or changing job content without task information. Still another argument in favor of analyzing jobs into tasks is the expectation that such an analysis would be easier to defend in the event of a legal challenge with respect to such issues as selection procedures or pay equity.

How Can Work-Oriented Job Information be Collected?

An important first step in collecting job information is a review of background data by the job analyst. This review is especially important if the analyst is unfamiliar with the job being analyzed. Pertinent background information can be gathered by looking at organizational charts (in order to see how the job being analyzed fits in with other jobs), training manuals, and existing job descriptions.

After this, a number of methods may be used to gather task information. They include:

1. interview (either individual or group),
2. observation,
3. a worker log (the worker records tasks engaged in over a set interval of time, such as an hour),
4. a position questionnaire (this can range from very detailed to open-ended and general, and is the basis of the task inventory method).
5. brainstorming, using incumbents and others familiar with the position.

Naturally, any of these techniques for data collection may be combined. Choice of any particular method depends on factors such as the purpose for the task analysis, educational level of the persons who supply the job information, nature of the job itself, and time available both on the part of the information providers and the job analyst. As an example, observation would provide a substantial amount of task information in the case of a patrol officer; however, observation would not yield as much information when a law clerk's job is being analyzed. The basic difference is in the type of activity. It is easy to observe physical activities, but tasks involving mental activities can only be derived from methods other than observation.

The sources of task information will usually include the workers and their supervisors. However, other occupational experts such as job counselors or teachers may provide helpful information. Still other sources of information for management jobs are the manager's subordinates.

How does the job analyst know that enough information has been obtained from enough people to do an adequate job analysis? Unfortunately, there is no clearcut answer to this question. A good index for determining how many people to contact is the number of positions within a job class. The more positions, the more people to be sampled. The most important things to consider are the consistency of data being obtained and the extent to which job duties are being captured. For example, job information collected from one worker may be vastly different from information collected from another individual, even though they are supposed to be in the same jobs. In this instance more people should be contacted to see if one of the cases was atypical. If job information collected from several individuals is comprehensive and consistent, it may be that no further data collection is necessary. This may be true despite the fact that there are a large number of workers in the job class.

Types of Scales Applicable to Task Analysis

Once the tasks have been described, any number of scales can be used in rating them. Often, an estimate of time spent on the task is asked for in a work-oriented job analysis. This estimate can take the form of the percentage of total work time a task requires. Or it is possible to estimate time spent on a particular task, relative to other tasks. How often a task is performed may also be reported.

Aside from describing tasks by the time spent performing them, tasks can be analyzed in terms of the amount of discretion a worker has in

performing them. A scale of this sort, which is part of FJA, might have the job analyst rate the task on a scale ranging from "complete freedom to do the task however and whenever the worker deems necessary" down to "procedural rules for the task are laid out completely; the worker has no discretion in performing the task." Other scales that have been used include complexity of the task, difficulty of performing it, and the consequence of error.

It is obvious that there are many types of scales which can be used to rate tasks. The purpose of the task analysis should always be kept in mind so that the appropriate rating information is gathered. For example, in personnel selection and classification it is helpful to determine the importance of tasks to the total job. Importance may be measured by adding together ratings of relative time spent, difficulty in performing the task, and consequences of error in performing the task. It has been shown that scales for rating tasks such as a relative-amount-of-time-spent scale are reliable indicators of task importance, (McCormick, 1976). In other words, these ratings show good agreement among raters, or a good deal of stability for individual raters over time (if the job does not change).

In addition to information bearing directly on tasks, it is often helpful to collect information indirectly related to tasks. Learning about the social, physical, and environmental characteristics of the work setting may help put a sense of perspective on task analysis results. To cite one example, the final results of a task analysis for

the job of patrol officer may differ substantially from Rochester, New York to Tampa, Florida, simply because of climate differences. A task such as "shovelling in order to free a car from a snow drift" is not an unusual one for a Rochester patrol officer. On the other hand, such a task is an unexpected one for a Tampa patrol officer. As this example shows, knowing something about a specific location may also help in generating job tasks which are not applicable to similar jobs in other locations.

Data Analysis

Work-oriented job analysis may generate a large number of tasks, sometimes as many as 500-1000 when task inventory type activities are listed. Also, these activities may be rated on numerous scales. The question to be addressed now is how to summarize and condense this mass of information.

Task data can be analyzed in a number of ways. It should always be kept in mind that the purpose of data analysis is to put unorganized information into a more usable form. Three methods for dealing with task information are: (1) computer analyses, including the Comprehensive Occupational Data Analysis Program (CODAP) (Christal, 1974); (2) a logical clustering of tasks; and (3) reducing the number of tasks to be considered. Each of these methods will be described briefly.

Computer Analysis. Work-oriented job analysis that leads to numerical ratings of tasks on a variety of scales may be analyzed by computer.

One system, the Comprehensive Occupational Data Analysis Program or CODAP (Christal, 1974), represents one of the most sophisticated approaches to computer analysis of task data. It was designed to provide ways of organizing, analyzing, and reporting information received from task inventories. As an example, one program in the CODAP system groups jobs into categories or clusters. Then it describes the nature of the work performed in each cluster. Other CODAP computer programs for organizing information are described more fully in Christal's (1977) report. Results from CODAP are highly consistent from one time to another (Moore, 1976).

Logical Clustering of Tasks. Project STAR (System Training and Analysis of Requirements for Criminal Justice Participants) (Smith, Pehlke, and Weller, 1974) uses a logical clustering system for dealing with task data. Tasks are associated with various roles under which they are performed to produce an overall role model for each job in question. An example of a role and a set of tasks grouped under it for defense attorney is as follows:

Role: advocates effective judicial process

Tasks:
1. communicating
2. conferring about cases
3. engaging in legal research
4. interacting with other agencies
5. participating in courtroom proceedings
6. participating in plea negotiations
7. participating in trial preparation conferences
8. training

(adapted from Smith et al., 1974, pps. 125-128)

A role usually involves more than one task and each task can be performed in several roles. It is clear from the example above that the role "advocated effective judicial process" involves several tasks. Likewise, the task "communicating" takes place in several roles, including "assists criminal justice and other appropriate agency personnel" and "protects rights and dignity of individual" (Smith et al., 1974).

Once task-role interactions have been discovered, performance objectives can be stated. Performance objectives are simply "statements of operational behavior required for satisfactory performance of a task, the conditions under which the behavior is usually performed, and the criteria for satisfactory performance." (Smith et al., 1974; italics and emphasis in original.) The net result is a set of behaviorally based performance objectives which may be used for training and/or performance evaluation.

Reducing the Number of Tasks to be Considered. A third way of dealing with tremendous amounts of task information is to eliminate the tasks which are not very important to the job. Importance of tasks can be assessed by asking incumbents to rate how critical each task is to adequate job performance. Only the most critical tasks may be retained; those tasks rated as not critical can be eliminated. It should be noted that job experts other than incumbents can also do the rating. In addition, time spent and frequency of task performance scales may be used in determining which tasks should be retained and

which ones eliminated. This process can be performed prior to or subsequent to generation of worker attributes needed to perform tasks in the later case; a similar process can also be used to reduce the number of task-related worker attributes.

Generation of Worker Attributes

In addition to collecting and rating task data, information is usually collected or developed about worker attributes needed to perform tasks. Worker attributes may be determined by ratings on a limited number of predetermined attribute scales, such as the General Educational Development scales (GED) associated with Functional Job Analysis (FJA). Or, a full set of task-specific knowledges, skills, abilities, and other characteristics (KSAO's) may be generated "from scratch" for each job analyzed. These KSAO's may then be rated for the degree of their importance to the job. A short description of selected scales is set forth below.

Functional Job Analysis uses pre-set scales. The assumption here is that virtually all useful information about worker attributes may be captured by judgments or ratings of how much or what kind of attributes a task requires of the worker. GED, mentioned above, is one of these scales.

There are three GED scales: (1) reasoning development, (2) mathematical development, and (3) language development. The level of functioning required by the worker in each of the three areas is rated.

GED measures educational development which can be obtained by attending elementary school, high school, or college.

Other FJA scales include:

1. Specific Vocational Preparation (SVP)--designed to tell how much training time is required for a job in order to achieve an average level of performance.

2. General Aptitude Requirements--as referenced by a set of examinations, the General Aptitude Test Battery (GATB). The job analyst has to determine the degree to which such general aptitudes as verbal aptitude and color discrimination are needed for general job performance.

3. General Worker Interest Requirements--as referenced by a set of mutually exclusive statements such as:

"a preference for activities involving business contact with people"	versus	"a preference for activities of a scientific nature" (U.S. Dept. of Labor, 1972, p. 317).

4. Temperaments--as referenced by various personality characteristics which are helpful to job performance. Some of the temperament factors which may be required by the job-worker interaction are "adaptability to accepting responsibility for the direction, control, or planning of an activity," and "adaptability to situations involving the interpretation of feelings, ideas, or facts in terms of personal viewpoint." (U.S. Dept. of Labor, pps. 297-298)

More complete information about these scales is contained in the Handbook for Analyzing Jobs.

The other approach--generation of KSAO's from task statements--can be done in at least two ways. The first way is to infer KSAO's directly from task statements. This is the method used in Guidelines Oriented Job Analysis (Biddle, 1977). Mussio and Smith (1973) point out that the inferential leap needed to obtain KSAO's from task state-

ments is often difficult to make. Therefore, the second method for generating KSAO's from tasks is to list discrete behaviors needed to perform a more global task. Then KSAO's obtained from tasks can be used in developing content-valid selection devices. As a final step, KSAO's may be evaluated for their importance to a job. As one example, Mussio and Smith rate KSAO's for selection purposes on the extent to which individual KSAO's distinguish between the superior and the average worker.

Verification of Tasks and Associated Worker Attributes

Once task information and worker attributes have been collected, it is important to check for missing information as well as information which can be deleted in the final job analysis report. Of the methods devised for this purpose, the Job Analysis Questionnaire (JAQ) (Iowa Merit Employment Office, 1977) is probably the most thorough.

In overview, the JAQ allows a group of raters who have not provided initial job analysis data to verify the quality of task statements and related information. These raters have the opportunity to add, delete, and comment upon all task statements and KSAO's which have been presented to them.

A second method for verifying information from a work-oriented job analysis is spelled out in the Handbook for Analyzing Jobs. It differs from the JAQ in that its purpose is to see whether results of an intensive analysis of one job can be extended to other apparently similar jobs without having to do a new job analysis.

This method of verifying job analysis can only be used when a job analysis and task description have been done for a job which is almost identical to the one being analyzed. Results of such a verification are aimed at similarity of major tasks for a job rather than all of the tasks. The Department of Labor method of job analysis verification differs from the JAQ primarily in that the JAQ verifies the job analysis in much more detail.

Verification of task and related information need not conform exactly to any particular method. What is important is that the outcome of a work-oriented job analysis be reviewed after its completion to check for oversights, erroneous ratings, and the like. The verification process will not only enhance the validity of the analysis, but will also insure its acceptance by the organization which must use the findings.

Some Work-Oriented Job Analysis Methods

Having discussed aspects of a number of work-oriented job analysis methods, it may be helpful to provide a summary of the entire process for selected methods. Those to be summarized are Functional Job Analysis (FJA), Brief Guidelines Oriented Job Analysis (GOJA), and Task Inventory. The choice of these methods should not be taken as an endorsement of them; rather they were chosen on the grounds that they are representative of the diversity of methods available to the user. For that reason, these descriptions should give the reader an even more concrete idea of what work-oriented job analysis is all about.

Functional Job Analysis (FJA) requires the careful writing of task statements which have been elicited by a trained job analyst through interviews, observation, or some other means. The preparation and editing of the task statements are perhaps the most crucial aspects of this method. The task statements should convey sufficient information as to their linkage with scales named Data, People, and Things.

Data are considered to be ideas, facts, and statistics. The People dimension comes into play whenever communication or interaction with others takes place. Communication can be verbal or nonverbal and can vary in level of complexity. The Things scale indicates the level of interaction with any tangible objects.

Tasks may be rated on the extent to which they require simple or complex relations with either Data, or People, or Things. Moreover, tasks may be rated on the extent to which they allow for discretion on the part of the worker. The tasks lead also to ratings on scales such as the General Educational Development scales mentioned previously. All this information is then compiled in the form of a report which may follow a prescribed format. Or, task statements may be placed in a document or on computer tapes in the form of a task bank. The reports and task banks may then be used for a variety of purposes. This method is painstaking, but thorough.

Brief Guidelines Oriented Job Analysis (GOJA) is a work-oriented job analysis method which is designed to be performed by a company with minimal help from an outside consultant. As the name suggests, the Brief GOJA form takes a relatively short time for the worker to complete--usually about two hours. The end result is all the information needed to devise personnel selection tools which conform to the procedure for content validation outlined in the EEOC Guidelines (1976). Judging from the sort of information obtained, the above statement can also be made with regard to the more recent Uniform Guidelines on Employee Selection (1978). With some slight modifications the information gathered should also be useful for other applications in addition to selection, such as classification and training.

The procedures for Brief GOJA are explained to the worker in an instruction manual which accompanies the job analysis form. In the first step of the task analysis, the worker is asked to list the four to eight "domains" of his/her job. These domains are defined as groups of duties which are related to each other.

Once the worker has listed the domains of the job, he generates a set of duties for each domain. A duty is defined as a major piece of a job. It is some action the employee usually takes or a responsibility the worker has. Similar duties (or those in which the action verb is the same) may be combined into one statement.

The next few steps in Brief GOJA are concerned with scaling the duties or tasks and identification of worker attributes needed for

task performance. Duties can be performed daily, weekly, monthly, quarterly, semiannually, or annually according to the Brief GOJA scales. Knowledges and Skills are identified as "...something you know or can do that enables you to perform the duties of your job well." In generating Knowledges and Skills, the worker looks at each of the duty statements and lists knowledges and skills needed to perform them. Knowledge and Skill statements are written to reflect the highest level of the particular knowledge or skill required by any of the duties of the job. Abilities are not used in Brief GOJA because they are not observable and may be criticized by the EEOC when the content validation strategy is being utilized. In addition, the worker is asked whether Knowledges and Skills listed can be learned in eight hours or less. Presumably, this job analysis technique is attempting to avoid including easily learned Knowledges and Skills in selection devices developed in order to avert trouble with the EEOC. This work-oriented job analysis method does ask for information about physical characteristics needed for the job and assorted information such as licensing or certification requirements and willingness to do things most other jobs do not require.

The final step in Brief GOJA is a linkage between the worker attributes which have been generated and specific job duties. This provides a basis for a content-valid selection instrument in accordance with federal guidelines.

The GOJA method is relatively efficient because information is gathered by self-administered questionnaires, therefore not requiring additional personnel to collect the job analysis information.

Task Inventory is typically a complete listing of tasks performed in the occupational area being analyzed. A good inventory tends to take a long time to develop (Archer and Fruchter, 1963), but can be worthwhile in the long run if there are many jobs to be analyzed. For this reason, task inventories have been used extensively in the Armed Forces (e.g., Archer and Fruchter, 1963; Morsh and Archer, 1967; Christal, 1969).

Tasks for a task inventory can be generated in at least two ways (Archer and Fruchter, 1963). Once job information has been collected from technical experts in the field, the writer of the task inventory has the option of developing tasks and pooling them into duty groups after the tasks have been generated. The second approach is to start out with an outline of general duties and derive tasks from the duties. In either case, the end result is a list of tasks which are performed by members of an occupational group.

According to McCormick (1976, p. 669), the next step in developing the task inventory is to write task statements. These statements have to conform to certain guidelines. They should be concise, clear, and worded so that they can be rated on the kinds of task rating scales mentioned before. Furthermore, the statements should not be overly general or overly elemental. They should be just specific enough so

that they represent identifiable units of work. Then, after the task statements are written, they should be verified by a group of occupational experts.

Once an all-encompassing list of task statements for an occupational group has been generated, job incumbents are asked to check those duties they perform and/or rate the tasks on a number of scales. As with any other task rating system, the types of scales which are appropriate are dictated by the purpose of the job analysis.

Task inventories should be used when it is necessary to do a job analysis for a large number of jobs in only a few occupational groups. The questionnaire approach allows for more workers to be sampled at lower cost than work-oriented techniques that rely on interviews.

Uses

Work-oriented job analysis can be used for a wide variety of purposes. In a comprehensive search of literature, Ash and Levine (1979) found eleven uses for all forms of job analysis combined. Job description and personnel requirement/specification are just two of these uses. Work-oriented job analysis appears to be applicable to all eleven uses. In a somewhat parallel list which deals only with work-oriented job analysis, the Handbook for Analyzing Jobs cites seven uses for this type of job analysis. These seven uses are: (1) recruitment and placement, (2) better utilization of workers, (3) job restructuring, (4) vocational counseling, (5) training, (6) performance

evaluation, and (7) plant safety. Since the Department of Labor's listing of job analysis uses deals only with work-oriented job analysis methods, it would be helpful to know how task information can be applied for each of the above uses.

In the first four uses suggested by the U.S. Department of Labor, job analysis information is used to maximize the match between jobs and people. This is accomplished by looking at tasks and worker attributes required in jobs, and assessing the entent to which applicants or incumbents possess the required attributes. In the case of training, the objective is to determine areas of mismatch between required worker attributes and current levels of those attributes. For performance evaluation, the match between required levels of task performance and actual levels of task performance is assessed. Plant safety may be enhanced through a consideration of aspects related to tasks such as materials, equipment, and physical hazards of the environment. Moreover, an assessment can be made of stresses and strains associated with performance of certain tasks. Where stress is high, tasks may be altered in some way in order to relieve the stress.

Teare and McPheeters (1970) deal primarily with the use of job analysis for job design. They suggest that work-oriented data can be used either in developing the organization or in a way that would maintain the status quo. According to Teare and McPheeters (1970), Job Factoring has been the traditional approach to creating jobs in professional areas. It is accomplished by breaking down tasks in

various jobs and regrouping them so that each job involves a homogeneous group of tasks. The net result of this process is that no new tasks are created; they are only juggled around. Thus, the status quo is maintained.

The Developmental Approach described by Teare and McPheeters (1970) uses task data in a nontraditional way. Instead of deriving tasks from existing jobs, a task or cluster of tasks comes about in response to some need or problem which requires action on the part of the organization. So the Developmental Approach uses the organization's objectives that are established in response to a need or a problem as the basis of the task analysis, not the job. This approach uses work-oriented information to assess future conditions, rather than maintaining the status quo. It can therefore be used to create new tasks and jobs in response to the needs and goals of the organization instead of simply perpetuating current conditions.

The discussion will turn now from theoretical to actual uses of work-oriented job analysis. Work-oriented job analysis has been widely used for a variety of purposes in both the public and private sectors. To cite an example, a recent survey by Levine, Bennett, and Ash (1979) showed that task analysis was the most widely used method of the job analysis techniques studied among public sector personnel-selection specialists. Approximately 60% of those surveyed used task analysis alone or in combination with other methods. Another example is the Dictionary of Occupational Titles (U.S. Department of Labor, 1977),

a massive compilation of descriptive information about jobs in both the public and private sectors which is based on work-oriented job analysis.

To focus specifically on the criminal justice system, the applications of work-oriented job analysis in a number of selected studies may be mentioned. A popular use for work-oriented job analysis in the criminal justice system has been in personnel selection. Work-oriented job analysis has been used to validate non-discriminatory police selection standards in the suburbs surrounding Minneapolis/St. Paul (Metropolitan Council, 1978). The State of Washington also used a task analysis procedure in validating its selection process for entry-level police officers (Strickler and Wollack, 1978). The City of Tampa employed work-oriented job analysis to validate selection procedures for the ranks of Patrol Officer, Sergeant, Lieutenant, and Captain (Love, 1978).

Employee selection has not been the only application found for work-oriented job analysis in the criminal justice system. The Georgia Peace Officer Standards and Training Council (1977) used task analysis for the multiple purposes of career development, training, testing, and certification decisions. The Philadelphia Police Department was able to validate a physical abilities test for the purposes of selection and performance appraisal using task analysis (Romashko, Hahn, and Brumback, 1976).

In an extensive study of the criminal justice system, task analysis was used in assessing training needs for 240 agencies in ten states (National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, U.S. Department of Justice, 1978). This study was unique in that jobs in the occupational areas of Corrections and Judicial Process were studied as well as Law Enforcement. Another interesting aspect of this study was its developmental use of the task-related information in making projections concerning tasks and knowledges which may be needed in the future for the criminal justice system. Project STAR (Smith, Pehlke, and Weller, 1974) also takes this developmental approach to the use of task data in stating performance objectives for several criminal justice jobs. Finally, the New York State Office of Court Administration (1978) used work-oriented job analysis data in creating a more equitable and efficient classification system for non-judicial positions in the Unified Court System.

These studies represent only a few of the uses found for work-oriented job analysis in the criminal justice system. If one may judge by the frequency of its use, task analysis has already found widespread acceptance in the criminal justice system.

Advantages and Disadvantages

In this section, advantages and disadvantages of work-oriented job analysis will be discussed. The first part of this section will

deal with work-oriented job analysis in general, while the second part will address advantages and disadvantages of the specific methods described previously.

Advantages and Disadvantages: General Work-Oriented Job Analysis

One important advantage of work-oriented job analysis is its defensibility in court when it is used in accordance with procedures outlined in the Uniform Guidelines on Employee Selection (1978). Courts and compliance review agencies will generally react more favorably to job analyses when the nature of the work performed is set out in detail and is carefully linked with the worker attributes used to design selection procedures.

Another advantage of work-oriented job analysis is that the task information collected is quite useful for writing job descriptions (McCormick, Mecham, and Jeanneret, 1977). Although McCormick, et al., include an option for writing job descriptions based on their worker-oriented Position Analysis Questionnaire (PAQ), they suggest using the job description found in the Dictionary of Occupational Titles with the PAQ information. Since the DOT job descriptions use work-oriented job analysis as their basis, it would appear that even these staunch advocates of a worker-oriented job analysis method admit that work-oriented methods are better suited to job descriptions.

Still another advantage is that task information can be used to create content-valid work sample tests. Obviously, if the selection

tests for a job are supposed to be samples of tasks necessary to the job, a work-oriented job analysis is a must. Specifically, after task information is collected, scales measuring importance and relative time performed for particular tasks would be helpful in determining what to put into the work sample. The content validity of such a sample is demonstrated when frequently performed tasks and/or important tasks are included in the test.

An additional advantage of work-oriented job analysis is that task information can be used for the establishment of training objectives. Without knowledge of tasks and current levels of worker performance related to tasks, it is difficult to state training objectives which are specific enough to be acted upon.

Moreover, work-oriented job analysis is virtually indispensable for job design and restructuring. Task analysis is especially important when job design and restructuring are used as organizational development interventions. Scales tapping worker satisfaction with particular tasks, as well as worker effectiveness measures for specific tasks, are helpful in determining how to structure the existing pool of tasks for a specific set of workers.

Despite the numerous virtues of work-oriented job analysis, there are several disadvantages. First and foremost is the cost and time involved in many of the work-oriented procedures. McCormick (1976) indicates that collection of task data can sometimes take up to six weeks or more, depending on the job or occupational group being analyzed.

This time factor and related costs (analyst time, cost from lost work time, etc.) must be taken into account before choosing work-oriented job analysis over other methods.

Another problem with work-oriented job analysis is that in most personnel selection, training, and performance appraisal applications, an "inferential leap" has to be made in determining the worker attributes required for task performance (Prien, 1977; Prien and Ronan, 1971; Brumback, 1976). There are no easy formulas for equating tasks with worker attributes. Rather, it is a matter of judgment.

Still another problem with work-oriented job analysis is actually and extension of the problem above. Because there is no way to translate tasks directly into worker attributes, there is no easy way of determining what level of knowledge or skill, for example, is necessary for superior or average performance on a task. This makes it hard to determine minimum qualification scores and ranking requirements when work-oriented job analysis is used to develop examinations. This also makes the development of suitable training courses difficult and affects the capacity to classify and evaluate jobs.

Another difficulty with work-oriented job analysis is that there is no firm basis for comparing different jobs (Prien and Ronan, 1971). This is because language used to describe tasks is specific to the job being analyzed. One solution to this problem is generation of common worker attributes from tasks. These attributes can be used as a basis of comparison among jobs.

The advantages of work-oriented job analysis seem to outweigh its disadvantages for many applications. Some of the problems of work-oriented job analysis can either be remedied by modifying the procedure slightly, or are shared in common with other job anlysis methods. On balance, the best advice to be offered now is that for completeness, any job analysis study should contain work-oriented information.

Now with a background of the virtues and pitfalls of work-oriented job analysis in general it is appropriate to discuss the advantages and disadvantages of some specific methods.

Advantages and Disadvantages: Specific Work-Oriented Job Analysis Methods

Functional Job Analysis (FJA). This method of job analysis is the most comprehensive of the work-oriented methods. Its unique advantages include use of the General Educational Development rating scale and scales for worker instructions and functions (Brumback, 1976), all of which exhibit good reliability (Fine, Holt, and Hutchinson, 1974). Furthermore, precision of the language is unequaled among work-oriented job descriptions (e.g., Dictionary of Occupational Titles, 1977) and a large bank of task data is already available for the purpose of comparison. The net result is a comprehensive, versatile, and reliable job analysis approach.

Unfortunately, FJA has a number of disadvantages. Brumback (1976) calls FJA one of his least favorite methods because it is laborious.

Moreover, its worker attribute scales are insufficient for such purposes as the design of job-related tests and development of training programs. Although Prien and Ronan (1971) advocate FJA as a "ready and precise method of analyzing and describing jobs," they complain that FJA does not allow for ready comparison between jobs. However, if a thorough, complete job analysis is required, FJA is one of the best methods available.

Brief Guidelines Oriented Job Analysis (GOJA). This method of work-oriented job analysis has the most potential value in a situation in which there is not enough time to do a job analysis on the scale of FJA. GOJA (Biddle, 1977) has advantages in that it is fast (it takes two hours to complete the form), up to 30 jobs can be analyzed simultaneously, and the method may provide information useful for a number of applications in addition to its primary purpose--the development of content valid selection tools. However, GOJA has a number of problems of which the user should be aware.

An important problem with GOJA is that it appears to be designed for highly verbal workers. This is so despite an apparent attempt to keep the reading level of the instruction manual down to a low high school level. However, a number of terms are not clearly defined, and there is an expectation that workers can write precise task statements.

A second problem with GOJA is its use of examples in sections with sentence completion format. The examples given after each item

are meant to be helpful in suggesting things which might complete the item. Although the instructions emphasize that these are merely examples, it is feared that the worker may be led in a particular direction when answering the items. Given the stretch of the imagination involved in listing duties and knowledges and skills, there is a good chance that the worker will be misled by the examples. This could result in a list of physical and other characteristics which do not accurately reflect job requirements.

A third disadvantage to GOJA has to do with the nature of its task rating scale. GOJA uses a frequency of task performance scale in which the worker can rate a task as occurring daily, weekly, monthly, quarterly, semiannually, or annually. Unfortunately, if the duty is performed every day for two months out of the year and not at all during the rest of the year, Biddle suggests that the average rate be marked (weekly in this case). This practice may result in an inaccurate job picture.

A final concern with GOJA has to do with the nature of the programs made available, as well as their relative costs. The complete program, which offers a substantial amount of training to the user organization, is quite expensive. On the other hand, an inexpensive alternative requires that the organization depend primarily on its own resources, with little training provided. However, this alternative may be dangerous to the extent that an organization may mistakenly assume it has achieved a high standard of performance in job analysis.

Brief GOJA may be useful when the workers whose jobs are being analyzed are fairly verbal, and when the analysis must be done quickly. However, it cannot be recommended without qualification now, simply because it does not have a sufficient "track record."

Task Inventory. One of the main advantages of task inventories is that they can be filled out with no special training (McCormick, 1976; Brumback, 1976). Since it does not require the job incumbent to generate task statements and/or statements of KSAO's, a task inventory can be used with workers of low verbal ability. In addition, this simplicity allows workers to play more of a part in the job analysis than normally would be feasible. This is not the case with most other work-oriented job analysis methods.

A second advantage is that the task scales used tend to be reliable, both from one time to the next (as long as the job does not change) and from one person to another. Furthermore, the form of the information obtained is easy to analyze using computer programs, statistical procedures, and/or logical procedures (McCormick, 1976). The ease of computer analysis tends to make task inventories particularly useful for job classification purposes.

As with other work-oriented job analysis methods, task inventories do have their disadvantages. One problem is the time involved in developing the task inventory (McCormick, 1976). Furthermore, since it is not unusual for a task inventory to have a hundred or more task statements and five to ten rating scales for each statement, completion of the inventory can be laborious and time consuming.

Perhaps the most suitable circumstances for use of a task inventory are encountered when there are a large number of incumbents, the job in question has been analyzed previously in other organizations, and/or the analyst is familiar with the job. Questionnaires can be more easily developed and data most efficiently gathered under these conditions.

Training Availability

Having become acquainted with the various work-oriented job analysis methods, one may wish to learn more about specific methods. The following list is presented as a guide for receiving training in various methods.

Functional Job Analysis (FJA)

1. Dr. Sidney Fine[1] offers an 18 session, weeklong workshop in FJA. Although he does not hold these workshops at regular intervals, he will agree to accommodate an organization upon request. The workshop is entitled "A Systems Approach to Task Analysis and Job Design" and is geared towards solving the job analysis problems of the organizations at the workshop. For more details, Dr. Fine may be contacted at the following address:

Dr. Sidney Fine
Advanced Research Resources Organization (ARRO)
4330 East-West Highway
Washington, D. C. 20014
Phone: (202) 986-9000

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[1]Personal communication; August 9, 1979.

2. A four-day course is offered upon request on the Department of Labor's version of FJA by the Occupational Analysis Field Centers located around the country. These centers are:

Arizona Department of Economic Security
P. O. Box 6123
Phoenix, Arizona 85005

California Employment Development Department
1525 South Broadway, Room 233
Los Angeles, California 90015

Florida Department of Commerce
404 Reo Street, Suite 108
Tampa, Florida 33609

Michigan Employment Security Commission
7310 Woodward Avenue
Detroit, Michigan 48202

Missouri Division of Employment Security
505 Washington Avenue
St. Louis, Missouri 63101

New York Department of Labor
Two World Trade Center, Room 7270
New York, New York 10047

North Carolina Employment Security Commission
P. O. Box 27625
Raleigh, North Carolina 27611

Texas Employment Commission
TEC Building
Austin, Texas 78778

Utah Department of Employment Security
P. O. Box 11249
Salt Lake City, Utah 84147

Washington Employment Security Department
300 West Harrison
Seattle, Washington 98119

Wisconsin Department of Industry, Labor,
and Human Relations
P. O. Box 2209
Madison, Wisconsin 53702

Brief Guidelines Oriented Job Analysis (GOJA)

Training in the Brief GOJA method can be obtained only through a contract with Biddle and Associates. They offer a choice of five different packages (Biddle, 1977). The packages range from the deluxe model for analyzing up to 90 jobs in thirty job cycles, to a brief orientation to the GOJA program. More specific information on Brief GOJA can be obtained from:

Biddle and Associates, Inc.
903 Enterprise Drive, Suite 1
Sacramento, California 95825
Phone: (916) 929-7670

Task Inventory and Related Techniques

The best way to receive help in constructing a task inventory is by seeking the aid of a private consultant who specializes in this area. Usually, such a person can be found through a local university. Or, technical information may be provided by appropriate agencies within the Federal or State government. For example, the U.S. Office of Personnel Management has a technical division that provides job analysis services to public agencies. The most important thing to remember in using consultants for any purpose is to check their credentials. One should make certain that the services offered by the consultant are, indeed, the services required by the organization.

After collection of information via a task inventory, it is necessary to analyze it. Comprehensive Occupational Data Analysis Programs (CODAP) can be used for this purpose. Dr. Douglas Goodgame[2] at Texas A&M University has been working in conjunction with the U.S. Navy on an update of the CODAP system, along with a user's manual. According to Lieutenant Commander William Rhinehardt, U.S.N.,[3] this manual is scheduled for distribution in mid-1979. Requests for the CODAP manual and related information may be made to:

> Navy Occupational Development and Analyst Center (NODAC)
> Building 150
> Washington Navy Yard (Anacostia)
> Washington, D. C. 20374

Lieuenant Commander Rhinehardt also indicated that help in installing the CODAP system is available to universities and organizations in the public sector.

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[2]Personal Communication; August 7, 1979.

[3]Personal Communication; August 13, 1979.

References

Archer, W. B., & Fruchter, D. A. The construction, review, and administration of Air Force job inventories (PRL-TDR-63-21). Lackland Air Force Base, Texas: Personnel Research Laboratory, Aerospace Medical Division, August, 1963 (NTIS No. AD-426 755).

Ash, R. A., & Levine, E. L. Evaluating the potential usefulness of job analysis methods: A framework for organizational decision makers. Submitted to Personnel Administrator, 1979.

Biddle, R. E. Brief GOJA: A two hour job analysis. Sacramento, California: Biddle & Associates, Inc., 1977.

Brumback, G. B. One method is not enough: An overview of selection oriented job analysis methodology. Paper presented at the Selection Specialists Symposium of the International Personnel Management Association, Chicago, July, 1976.

Christal, R. E. The United States Air Force occupational research project (AFHRL-TR-73-75). Lackland Air Force Base, Texas: Occupational Research Division, January, 1974.

Christal, R. E. Comments by the chairman. In Proceedings of the Division of Military Psychology Symposium: Collecting, analyzing, and reporting information describing jobs and occupations. Symposium presented at the 77th Annual Convention of the American Psychological Association, Lackland Air Force Base, Personnel Research Division, Air Force Human Resources Laboratory, Texas, September, 1969.

Equal Employment Opportunity Commission. Guidelines on employee selection procedures (republication of guidelines). Washington, D. C.: The National Archives of the United States, November 24, 1976.

Equal Employment Opportunity Commission, U. S. Civil Service Commission, U. S. Department of Labor, and U. S. Department of Justice. Uniform Guidelines on Employee Selection. Federal Register, August 25, 1978, 43, (166), 38290-38315.

Fine, S. A. Functional Job Analysis scales: A desk aid. Methods for Manpower Analysis No. 7. Washington, D. C.: The W. E. Upjohn Institute for Employment Research, 1973.

Fine, S. A., Holt, A. M., & Hutchinson, M. F. Functional Job Analysis: How to standardize task statements. Methods for Manpower Analysis No. 9. Washington, D. C.: The W. E. Upjohn Institute for Employment Research, 1974.

Fine, S., & Wiley, W. An introduction to Functional Job Analysis: A scaling of selected tasks from the social welfare field. Methods for Manpower Analysis, No. 4. Washington, D. C.: The W. E. Upjohn Institute for Employment Research, 1971.

Georgia Peace Officer Standards and Training Council. A job analysis of entry level peace officers in Georgia: Phase I report, Project Careers. Atlanta: Georgia Peace Officers Standards and Training Council, October, 1977.

Iowa Merit Employment Department, Examination, Research and Development Section. Job Analysis Guidelines. Iowa: Iowa Merit Employment Office, July, 1974.

Iowa Merit Employment Department, Examination Research and Development Section. Job Analysis Questionnaire (2nd edition). Iowa: Iowa Merit Employment Office, 1977.

Levine, E. L., Bennett, N., & Ash, R. A. Evaluation and use of four job analysis methods for personnel selection. Public Personnel Management, 1979, 8, 146-151.

Levine, E. L., Bennett, L. J., & Ash, R. A. Exploratory comparative study of four job analysis methods, Research Report #20. State of Arizona: Department of Administration, Selection Research Center, 1977.

Love, K. G. Validation of selection procedures for police classes: Officer, sergeant, lieutenant, and captain, Phase I: Job analysis. Tampa, Florida: City of Tampa, Test Validation Division, Civil Service Board, June, 1978.

McCormick, E. J. Job and task analysis. In M. D. Dunnette (Ed.) Handbook of industrial and organizational psychology. Chicago: Rand McNally College Publishing Company, 1976.

McCormick, E. J., Jeanneret, P. R., & Mecham, R. C. A study of job characteristics and job dimensions as based on the Position Analysis Questionnaire (PAQ). Journal of Applied Psychology, 1972, 56, 347-368.

McCormick, E. J., Mecham, R., & Jeanneret, P. Position Analysis Questionnaire--Technical Manual (System II). Logan, Utah: PAQ Services, Inc., 1977.

Metropolitan Area Management Association and the Metropolitan Council. Selecting police officers: A study of suburban police. St. Paul, Minnesota: Metropolitan Council, May, 1978.

Moore, B. E. Occupational analysis for human resource development: A review of the task inventory, Research Report No. 25. Washington, D. C.: Department of the Navy, Office of Civilian Manpower Management, April, 1976.

Morsh, J. E., & Archer, W. B. Procedural guide for conducting occupational surveys in the United States Air Force (PRL-TR-67-11). Lackland Air Force Base, Texas: Personnel Research Laboratory, Aerospace Medical Division, September, 1967.

Mussio, S. J., & Smith, M. K. Content validity: A procedural manual. Minneapolis: City of Minneapolis, Civil Service Commission, Division of Personnel Research, February, 1973.

National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, U. S. Department of Justice. The National Manpower Survey of the Criminal Justice System. (Stock Number 027-000-00661-2) Washington, D. C.: U. S. Government Printing Office, 1978.

New York State Office of Court Administration. Proposed classification plan for non-judicial positions in the Unified Court System. Albany, New York: New York State Office of Court Administration, September, 1978.

Prien, E. P. The function of job analysis in content validation. Personnel Psychology, 1977, 30, 167-174.

Prien, E. P., & Ronan, W. W. Job analyses: A review of research findings. Personnel Psychology, 1971, 24, 371-396.

Primoff, E. How to prepare and conduct job element examinations (TS 75-1, U. S. Civil Service Commission, Bureau of Policies and Standards, Personnel Research and Development Center). Washington, D. C.: U. S. Government Printing Office, June, 1975.

Romashko, T., Hahn, C. P., & Brumback, G. B. The prototype development of job-related physical testing for Philadelphia police selection: Final report. Washington, D. C.: American Institutes for Research, July, 1976.

Rouleau, E. J. & Krain, B. F. Using job analysis to design selection procedures. Public Personnel Management, 1975, 4, 300-304.

Schmidt, F. L., Hunter, J. E., Pearlman, K., & Shane, G. S. Further tests of the Schmidt-Hunter Bayesian validity generalization procedure. Personnel Psychology, 1979, 32, 257-281.

Smith, C. P., Pehlke, D. E., & Weller, C. D. Role performance and the Criminal Justice System, Volume II: Detailed performance objectives. Cincinnati, Ohio and Santa Cruz, California: Anderson Davis, 1974.

Strickler, H., & Wollack, S. Washington State project on entry level police selection and test validation. Paper presented at the Job and Task Analysis symposium, Dallas, November 12-14, 1978.

Teare, R. J., & McPheeters, H. L. Manpower utilization in social welfare. A report based on a symposium on manpower utilization in social welfare services, Georgia Department of Family and Children's Services, 1970.

U. S. Civil Service Commission, Bureau of Intergovernmental Personnel Programs. Job analysis for improved job related selection: A guide for state and local governments. Washington, D. C.: U. S. Government Printing Office, November, 1975.

U. S. Department of Labor. Handbook for analyzing jobs. Washington, D. C.: U. S. Government Printing Office, 1972.

U. S. Department of Labor, Employment and Training Administration. Dictionary of Occupational Titles, Fourth Edition. Washington, D. C.: U. S. Government Printing Office, 1977.

Chapter 4

REVIEW OF THE ABILITY REQUIREMENTS SCALES

Contents

Description

The Ability Requirements Scales were developed by Fleishman and his colleagues (1975) in order to provide a means of classifying tasks according to specific human ability requirements. This classification scheme was designed to meet the following criteria:

1. it should provide a way of distinquishing individual differences in performance and learning ability, and
2. it should be applicable to all tasks.

The extent to which the classification scheme derived from the Ability Requirement Scales meets these two criteria is related to its adequacy as a tool for analyzing jobs.

Before discussing Fleishman's taxonomy, it is helpful to know exactly what he means by "ability." An ability is a general trait (Fleishman, 1972). An ability is different from a skill in that a skill is proficiency at a single task; an ability is an intangible attribute which makes some people better performers than others on groups of related tasks. For example, a person having good reaction time (an ability) would be expected to perform better than a person with poor reaction time at tasks such as "brakes car in order to avoid small child who has darted into the road" and "jumps out of the way of a thrown object," other things being equal. The tasks in the example appear to be dissimilar, but they both require good reaction time ability.

After a series of studies (e.g., Farina, 1967; Farina and Wheaten, 1971; Fleishman, 1967, 1972, 1975; Brumback, Romashko, Hahn, and Fleishman, 1974) Fleishman and his colleagues at the American Institutes for Research (AIR) developed a list of 37 abilities which appear consistently across situations, jobs, and tasks. These abilities fall into four categories: (1) mental abilities, (2) physical abilities, (3) abilities which require some action to be taken when specific sensory cues are present, and (4) abilities having to do with the way incoming sensory material is perceived. The abilities which fall into each of these categories are listed below. In addition, definitions for each of the abilities and illustrative examples are cited (adapted from Brumback, Romashko, Hahn, and Fleishman, 1974).

Mental Abilities

1. Verbal Comprehension: ability to understand language (e.g., understand what is said in conversation, ability to comprehend a written memo).

2. Selective Attention: ability to perform a task without loss in efficiency when the task is monotonous or while in the midst of distracting stimulation (e.g., talking on the telephone while people are holding conversations around you, keypunching numbers for eight hours a day while maintaining a good pace).

3. Memorization: ability to memorize and retain new information (e. g., studying the scene of the crime and memorizing the position of everything in the room in order to recall it for testimony in a courtroom, memorizing written material for an exam).

4. Verbal Expression: ability to use language in order to communicate (e.g., giving directions to a building, telling someone how to be a good witness).

5. Problem Sensitivity: ability to recognize or identify the existence of problems (e.g., recognizing that a prison disturbance is about to erupt, troubleshooting a combustion engine).

6. Deductive Reasoning: ability to reason from the general to the specific (e.g., concluding that a missing person who has little money may be found at a cheap hotel).

7. Originality: ability to produce unusual or clever responses related to a given topic or situation (e.g., discovering clever uses for a new piece of equipment).

8. Time Sharing: ability to use information obtained by shifting between two or more channels of information (e.g., driving a squad car safely while shifting your attention between the dashboard dials, the road and the radio).

9. Inductive Reasoning: ability to reason from the specific to the general (e.g., concluding that victims of crime are usually emotional and confused based on contacts with individual victims).

10. Number Facility: ability to manipulate numbers in numerical computations (e.g., computing the personnel services budget for a court using appropriate arithmetic computation).

11. Information Ordering: ability to apply rules or objectives to given information in order to arrange it into the best or most appropriate sequence (e.g., arranging material in an in-basket according to priority for attention).

12. Mathematical Reasoning: ability to reason abstractly using quantitative concepts and symbols (e.g., using statistics to make manpower needs forecasts).

13. Ideational Fluency: ability to produce a number of ideas concerning a given topic (e.g., generating ideas for a paper on the criminal justice system in the United States).

14. Category Flexibility: ability to produce many sets of rules or specifications and to use each of them in sorting items into alternative groupings (e.g., setting up a cross-indexed filing system for court cases according to defendant's name, lawyer handling the case, type of charges, and presiding judge).

Physical Abilities

1. Stamina: ability to do physical work for a long period of time (e.g., running after a suspect for a long distance).

2. Static Strength: ability to lift, push, or pull an object continuously up to the amount of muscle force needed to move the object (e.g., lifting a disabled person, pushing a car out of a snow bank).

3. Explosive Strength: ability to use short bursts of muscle force (e.g., running at top speed for short distances).

4. Gross Body Equilibrium: ability to keep the body in an upright position or to regain balance (e.g., walking on top of a fence without falling).

5. Extent Flexibility: ability to reach out, bend or stretch muscle groups to a given degree (e.g., reaching out over a pier to grab a person out of the water).

6. Gross Body Coordination: ability to use the trunk, arms, and legs together in movement (e.g., defending oneself in hand-to-hand combat).

7. Dynamic Strength: ability to hold up or move one's own body weight repeatedly or at one time without stopping, using the force of arm and trunk muscles (e.g., pulling oneself over a roof ledge).

8. Dynamic Flexibility: ability to make repeated trunk and/or arm and leg bending or stretching movements where speed as well as accuracy counts (e.g., riding a bicycle).

9. Speed of Limb Movement: ability to make quick, single movements of the arms or legs (e.g., kicking away an assailant).

Abilities Which Require Some Action to be Taken When Specific Sensory Cues are Present

1. Choice Reaction Time: ability to select and initiate quickly the appropriate response to stimulus (e.g., turning the steering wheel of a car sharply in an appropriate direction in order to avoid a vehicle which is out of control).

2. Reaction Time: ability to initiate quickly a single motor response to a single stimulus (e.g., pressing a warning button immediately upon seeing a red danger light).

3. Control Precision: ability to make controlled muscular movements necessary to adjust or position a machine or equipment control mechanism (e.g., aiming a firearm).

4. Manual Dexterity: ability to make skillful, coordinated movements of hand, or of a hand together with its arm (e.g., picking up objects about the size of golf balls).

5. Multilimb Coordination: ability to coordinate the movements of two or more limbs (e.g., paddling a canoe).

6. Rate Control: ability to make timed, anticipatory motor adjustments relative to changes in the speed and/or direction of a continuously moving object (e.g., keeping up with a suspect in a high speed chase).

7. Arm-Hand Steadiness: ability to make precise, steady arm-hand positioning movements where strength and speed are relatively unimportant (e.g., pointing to a particular spot on a computer printout without tremor).

8. Wrist-Finger Speed: ability to make discrete, fast movements of the fingers, hands, and wrists (e.g., taking notes at the scene of a crime).

9. Finger Dexterity: ability to make skillful, coordinated movements of the fingers (e.g., typing).

Abilities Having to do With the Way Incoming Sensory Material is Perceived

1. Spatial Orientation: ability to maintain one's orientation or to comprehend the arrangement of spatial patterns with respect to objects in space (e.g., judging the relative distance of two objects).

2. Flexibility of Closure: ability to isolate the specified relevant stimulus from a sensory field in which there are distracting stimuli (e.g., discriminating important bits of evidence at a crime scene).

3. Perceptual Speed: ability to compare quickly sensory patterns or configurations (e.g., comparing sets of fingerprints to determine if they are the same or different).

4. Visualization: ability to manipulate or transform the visual images of spatial patterns or objects into other spatial arrangements (e.g., picture how a room would look if the furnishings were rearranged).

5. Speed of Closure: ability to combine quickly all the sensory elements presented from a single source of information into a meaningful configuration (e.g., concluding that a piece of metal which resembles gold is not gold because it differs in important qualities such as hardness, density, etc.).

How may these abilities be used for analyzing jobs? During the actual job analysis, the individual studying the job uses a series of scales which measure the extent to which each of the abilities is required to perform the job as a whole or individual tasks which are part of the job. Alternatively, a knowledgeable incumbent or supervisor may rate the job or tasks on these scales. Simply stated, the job is analyzed by rating how much each of these abilities is required for average job or task performance.

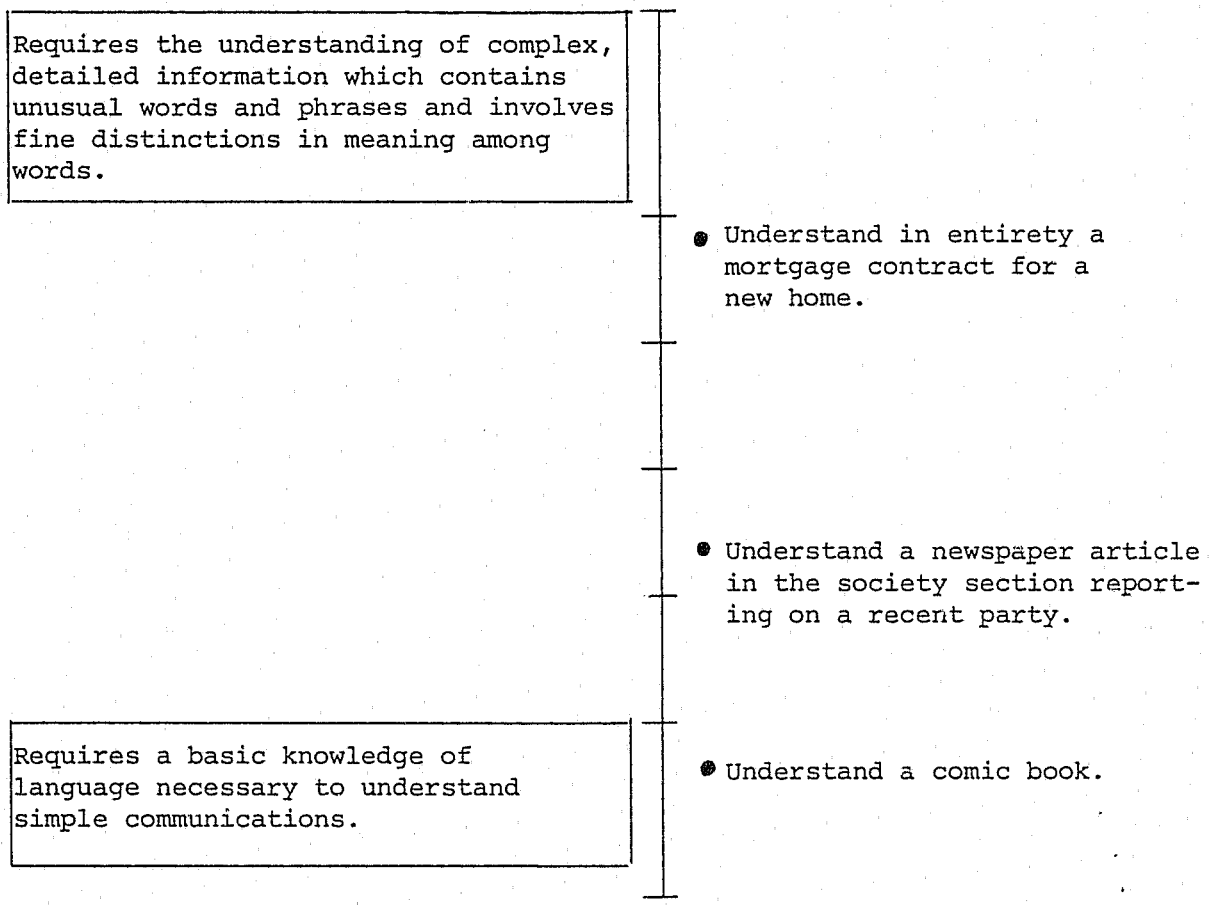
The scales used in the job analysis are the Ability Requirements Scales. They are 5 or 7-point rating scales, with three examples, or behavioral/task anchors, which would require certain levels of the ability in question. It should be noted that these behavioral anchors are based on a good deal of empirical research. An example of a typical Ability Requirements Scale is given in Table 1 for Verbal Comprehension Ability.

In dealing with job analysis at the level of tasks, Fleishman (1972, 1975) suggests two ways to determine how relevant a particular ability is to a task. The first way is to break the task into its various components such as "goal," "nature of the response required to

Table 1

Example of an Ability Requirement Scale[1]

VERBAL COMPREHENSION



[1] Task statements have empirically determined scale values (From Fleishman, 1975).

reach the goal," "how to go about making the response," "the nature of the thing which tells the worker to respond," and "the way in which the worker has to process all of these components in order to reach the goal." These task components are further broken down into task characteristics, from which it is easy to infer abilities requirements.

The second method for determining abilities required for performing specific tasks uses a decision tree, in which the analyst decides, step by step, whether each ability is relevant to the task. The advantage of this approach is that it organizes the analyst's decision-making process. If each step is followed exactly, no ability should be overlooked.

It should be noted that the Ability Requirements Scales may be used in rating abilities needed for the job as a whole as well as for individual tasks. If individual tasks are evaluated, the amount of job data obtained is often unwieldy. As is noted by Levine and Weiner (1979), it is not unusual for a task analysis to yield a hundred or more tasks for a single occupational group. Multiply that number by the thirty-seven Ability Requirements Scales and the result is a mass of data with which it is almost impossible to deal.

There are at least two ways of resolving this dilemma. If the goal of the job analysis is to retain specific task information, a clustering technique such as factor analysis may be used. The nature of clustering techniques is to reduce the number of tasks needed to describe the

abilities requirements into overall dimensions while retaining as much task-relevant information as possible. Alternatively, only the most important tasks might be considered.

Uses

Since the Ability Requirements Scales are relatively new to the job analysis scene, it is difficult to state definitively their usefulness for some of the typical job analysis applications or functions. Therefore, a listing of potential uses will be mainly speculative, although an attempt will be made to provide specific examples of their use in the criminal justice system wherever possible.

Of the eleven uses for job analysis information listed by Ash and Levine, at least five appear to be applicable to the Ability Requirements Scales. These five uses are: (1) job classification, (2) job evaluation, (3) job design/restructuring, (4) personnel requirements/specification, and (5) manpower/workforce planning. Each application is discussed in relation to the Ability Requirements Scales below.

Job Classification

In a job classification application of the Ability Requirements Scales, jobs can be grouped according to similarities in patterns of abilities required.

Job Evaluation

For job evaluation, the Ability Requirements Scales might be used to rate all jobs in an organization. Then these ratings could be related to salaries by forming a functional equation between salary and abilities ratings. When new jobs are established, salary levels may be set by rating the jobs on the Ability Requirements Scales and basing the salaries on the outcome of the equation.

Job Design/Restructuring

In this application of abilities analysis, abilities required for specific tasks are examined. Tasks may then be arranged so that they require a similar group of abilities if efficiency is the goal of the restructuring. Or, tasks may be arranged so that the abilities required for task performance are matched to abilities of the worker.

Personnel Requirements/Specification

This is one application where an example in the criminal justice system has been located. Romashko, Hahn, and Brumback (1976) used a physical abilities analysis in order to design a selection exam for the Philadelphia Police Department. The basic approach was to have job specialists rate the job tasks which were generated by police officers on ability requirements. The most important of these ability requirements were then chosen in designing the physical tests.

Manpower/Workforce Planning

Projections may be made as to how jobs in an organization would look some years in the future. It is possible to rate these projected jobs on the Ability Requirements Scales. In addition, the current workforce could be assessed on the abilities required for these future jobs. If the current workforce lacks important abilities for the future jobs, training, recruiting, and selection programs may be adjusted accordingly.

Again, it must be emphasized that the Ability Requirements Scales have not been utilized in many situations. There may be some other potential uses for the scales (e.g., worker training was suggested as an application by Fleishman in 1975), but the case is not as strong for them as for the five which are listed here. The extent to which the Ability Requirements Scales may be justified in each use can be determined only through field testing and application.

Advantages and Disadvantages

Only one study has been found which considered the advantages and disadvantages of the Ability Requirements Scales. This was a study conducted by Brumback, Romashko, Hahn, and Fleishman (1974) in which selection materials were developed for three New York City public service positions. These tests were based on the results of several job analysis techniques including the Ability Requirements Scales.

One advantage of the Ability Requirements Scales listed by Brumback et al. (1974) is its "off-the-shelf" availability. In other words, the basic instrument does not have to be constructed each time a job analysis is to be done. Related to this is what Brumback et al. (1974) refer to as occupational versatility. Since the instrument is not designed for any specific job, it can be used for assessing ability requirements regardless of the occupational field. Behavioral anchors for the scales are designed to be in the realm of the average person's experience, so that the scales should be interpreted uniformly.

Another advantage to the method is that it yields data which can be used is setting norms (Brumback et al., 1974). Comparisons may be made between jobs on the basis of abilities patterns for the purpose of job evaluation. This can be done because job requirements are reduced to a common language defined by the abilities scales. Likewise, performance norms may be set for individual jobs, since the abilities requirements are based on an average level of job performance.

Other advantages listed by Brumback et al. (1974) are: (1) little training time is needed for analysts, (2) the method can be used for validating selection tools if it is used along with precise task examples, and (3) reliability is potentially high after a few minor changes are made in task anchors and some of the ability definitions.

Brumback and his colleagues (1974) acknowledge only one disadvantage of the Ability Requirements Scales. Since it is relatively new and untried, refinement is necessary before the method may be considered to be fully operational. Most of the problems stem from the behavioral anchors used with non-physical abilities. The main problem with the anchors is that they tend to be too abstract, resulting in inconsistent interpretations. This problem can be remedied at the expense of occupational versatility of the tool. Anchors simply can be made more job specific so that the scales can be applied consistently.

Training Availability

Unfortunately, there are no readily available training programs or manuals at this time on the use of the Ability Requirements Scales.[1] Fleishman is currently working on refinements of the task anchors for the scales and expects to have some training material ready in the next few months.

The best way to obtain information on the use of the Ability Requirements Scales is to contact Dr. Edwin Fleishman at the address below:

Dr. Edwin Fleishman
Advanced Research Resources Organization (ARRO)
4330 East-West Highway
Washington, D. C. 20014

Since the scales are not perfected, Dr. Fleishman recommends use of the Ability Requirements Scales only with his assistance.

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[1]Personal communication with E. A. Fleishman, August 24, 1979.
Personal communication with G. B. Brumback, August 23, 1979.

References

Ash, R. A., & Levine, E. L. Evaluating the potential usefulness of job analysis methods: A framework for organization decision makers. Submitted to Personnel Administrator, 1979.

Brumback, G. B., Romashko, T., Hahn, C. P., & Fleishman, E. A. Model procedures for job analysis, test development and validation. Prepared under contract for New York City Department of Personnel, American Institutes for Research, AIR-37600-4/74-FR, July, 1974.

Farina, A. J., Jr. Development of a taxonomy of human performance: A review of descriptive schemes for human task behavior. Technical Report #2, American Institutes for Research, AIR-725-1/69-TR-2, 1969.

Farina, A. J., & Wheaten, G. R. Development of a taxonomy of human performance: The task characteristics approach to performance prediction. Technical Report #7, American Institutes for Research, 1971.

Fleishman, E. A. Development of a behavior taxonomy for describing human tasks: A correlational-experimental approach. Journal of Applied Psychology, 1967, 51, 1-10.

Fleishman, E. A. On the relationship between abilities, learning, and human performance. American Psychologist, 1972, 27, 1017-1032.

Fleishman, E. A. Toward a taxonomy of human performance. American Psychologist, 1975, 30, 1127-1149.

Levine, E. L., & Weiner, H. R. Review of work-oriented job analysis methods: Functional Job Analysis, task analysis and related techniques. Human Resources Institute, Center for Evaluation Research, University of South Florida, 1979.

Romashko, T., Hahn, C. P., & Brumback, G. B. The prototype development of job-related physical testing for Philadelphia policeman selection. Prepared under contract for City of Philadelphia Personnel Department, American Institutes for Research, July, 1976.

Chapter 5

REVIEW OF THE CRITICAL INCIDENT TECHNIQUE

Contents

Description

In a general sense, the Critical Incident Technique (CIT) is a method of research as well as a method of job analysis. It originated as an outgrowth of studies in the Aviation Psychology Program of the United States Army Air Forces in World War II. The purpose of these studies was the identification of critical factors in human performance in a variety of military situations. Flanagan (1954a) discusses a number of these studies, as well as the development of the CIT methodology.

The CIT is a set of procedures for collecting direct observations on human behavior in such a manner as to facilitate their potential usefulness in solving practical problems and developing psychological principles. An incident is defined as observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act. To be a critical incident, that incident must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects.

Emphasizing that the Critical Incident Technique is a flexible set of principles which must be modified and adapted to meet the situation at hand, Flanagan (1954a) identifies five main steps in the procedure:

1. Determination of the general aim of the activity being analyzed, or a brief statement obtained from authorities in the field which expresses in simple terms those objectives to which most people would agree.

2. Development of plans and specifications for collecting factual incidents regarding the activity. This involves providing specific instructions to people supplying or generating critical incidents with respect to the situations observed, the relevance to the general aim of the activity, and the extent of the effect on the general aim. It also includes the specification of qualifications and training for the persons generating the critical incidents.

3. Collection of the data. Critical incidents can be collected be means of individual interviews, group interview-questionnaire methods, mailed questionnaires, and record form or diary procedures. Flanagan observes that between 2,000 and 4,000 critical incidents are required to establish a comprehensive statement of requirements for jobs of a supervisory nature, and that between 1,000 and 2,000 incidents seem to be adequate to cover the critical behaviors for semi-skilled and skilled jobs.

4. Analyzing the data. This involves selection of the general frame of reference that will be most useful for describing the incidents, the inductive development of a set of major area and the subarea headings, and the selection of one or more levels among the specificity-generality continuum to use in reporting the requirements.

5. Interpreting and reporting. In order to avoid faulty inferences and generalization, the limitations of the particular study must be brought into clear focus. The nature of judgements made in collecting and analyzing the data must be carefully reviewed.

Dunnette (1966) discusses the Critical Incident Technique specifically as a job analysis method. He defines job analysis as defining the job and discovering what the job calls for in employee behavior, and differentiates between job-centered and behavior-centered methods. The major purpose of job-centered methods is to describe a job as thoroughly as possible in writing, dealing with the job primarily as

a static entity. Behavior-centered methods, on the other hand, define the job in terms of those behaviors necessary for successfully performing it. Noting that the CIT method will typically yield both static and dynamic aspects of a job, and that anecdotal accounts of what an employee actually did focus attention on both situationally determined elements and modes of behavior, he describes the method as follows:

> This method (CIT) asks supervisors, employees, or others familiar with a job to record critical incidents of job behavior. The incidents are just what the name implies--actual outstanding occurrences of successful or unsuccessful job behavior. Such occurrences are usually recorded in stories or anecdotes. Each one describes (1) what led up to the incident and the setting in which it occurred, (2) exactly what the employee did that was so effective (or ineffective), (3) perceived consequences of the critical behavior, and (4) whether such consequences were actually within control of the employee. After a large number of such incidents are collected, they may be abstracted and categorized to form a composite picture of job essentials. These categories, in turn, form a behaviorally based starting point for developing checklists of task behaviors regarded as crucial to either effective or ineffective performance (pps. 79-80)

Dunnette (1966) notes that such a checklist serves as the basic research instrument for answering specific job analysis questions:

1. Which task may be grouped into relatively homogeneous task clusters?

2. What job dynamics must be taken into account? (E.g., how does the job change over time or situations? Whict tasks are important for new employees vs. experienced employees?)

3. What (more specific) employee behaviors are demanded by the job?

4. What worker requirements may be inferred?

5. How may employee behaviors be observed and measured?

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6. Are there other implications such as the need for job redesign, equipment modification, or reorganization?

The primary value of the CIT lies in the fact that it provides a record of specific behaviors from those persons in the best position to make the necessary observations and evaluations. According to proponents of the method, (e.g., Flanagan, 1954a; and Dunnette, 1966) a data base consisting of representative samples of behavior relevant to the problem(s) at hand is superior to a collection of opinions, hunches, and estimates. However, it must be emphasized that critical incidents represent only raw data and do not automatically provide solutions to problems.

Uses

Flanagan (1954a) identifies the following uses or potential uses of Critical Incident Technique data:

measures of typical performance (criteria)
measures of proficiency (standard samples)
training
selection and classification
job design and purification
operating procedures
equipment design
motivation and leadership (attitudes)
counseling and psychotherapy

However, the method has been used primarily in the area of performance appraisal and evaluation. Fivars (1973) compiled a bibliography of over 600 studies in which the CIT was used. Roughly 75% of the citations are indexed under the proficiency/performance/evaluation categories; 5% are listed under selection/classification; and 5% under training.

Performance Measurement and Evaluation

Smith and Kendall (1963) developed a procedure for the construction of behavioral expectation scales (BES)--also called behaviorally anchored rating scales (BARS), and behaviorally based rating scales. Essentially, subject matter experts identify qualities or dimensions to be evaluated, formulate general definitions of high, acceptable, and low performance for each quality, and submit examples of behavior (critical incidents) in each dimension. The examples are edited into the form of expectations of specific behavior. Judges indicate, independently, what dimension is illustrated by each example (retranslation), and rate each example according to the desirability of the behavior illustrated. Investigations have shown that the resulting rating scale items can discriminate among outstanding and unsatisfactory performers quite well, and enjoy high scale reliability. The finished rating scales for each dimension may consist of general definitions of high, acceptable, and low performance along with a continuum defined by specific behavioral incidents with the appropriate scale values, or the dimension definition and the continuum defined by behavioral incidents without the general definitions of performance (Campbell, Dunnette, Arvey, and Hellervik, 1973).

The advantages of behavioral expectation scales (BES) include the following: (1) they are rooted in and referable to actual observed behavior; (2) the behavior has been evaluated by judges

comparable to those who (will) use the scales; (3) the dimensions are operationally defined and distinguishable one from another by the rater; and (4) there is a good chance of adequate comparability of ratings by different raters as long as they agree with interpretations of expectations. Variants of the Smith and Kendall methodology have been used to construct BES for the job of department manager in retail stores (Campbell, et al., 1973), nurses (Zedeck and Baker, 1972), and municipal police officers (Landy, Farr, Saal, and Freytag, 1976) to name a few.

Another type of performance appraisal insturment using data derived from the CIT is the behavior observation scale (BOS). The BOS is very similar to the BES just described. However, in a BOS each critical behavior is directly listed in a questionnaire format (not edited into the format expectations of behavior) and the rater indicates the frequency with which he has observed the behavior. The BOS would seem preferable to BES where there is a high degree of contact between the rater and the ratees; the BES may be preferable when there is minimal opportunity for the rater to observe the ratee (Latham and Wexley, 1977).

Training

The CIT has been used to identify behavioral areas of dimensions in which training is needed, the job classifications in organizations for which training is needed, to develop the actual content of training programs, and to evaluate the effectiveness of training programs.

Flanagan (1961) cites a number of critical incidents as support for the contention that practical experience in using leadership skill is a highly desirable and necessary component of effective leadership training programs. He suggests chat such practical experience can be provided through role playing and situational problems. Both Hahn (1956) and Suttell and Richlin (1954) used the CIT to develop realistic situational performance problems for training junior officers in leadership behaviors.

Miller and Folley (1952) used the CIT in establishing training requirements for specific types of maintenance mechanics. In an institution for the mentally retarded Fleming (1962) used the CIT to identify and differentiate between staff behavior areas which needed particular training emphasis versus those areas in which the staff performed adequately. He also used CIT data to determine which job classifications (vocations) required additional in-service training.

Anderson and Anderson (1971) used the CIT to develop a questionnaire for evaluating the effectiveness of an individual and group relations seminar for secretaries in a chemical company. Ronan (1953) developed three evaluation devices as well as a program of training for emergency procedures in multi-engine aircraft from data collected via the CIT.

According to Flanagan (1954a), the obvious relevance of the behaviors involved in critical incidents and the specific details included make them an ideal basis for developing training programs and related materials.

Selection

Flanagan (1951) describes the "method of explicit rationales" as providing for systematic consideration of the actual behavior to be predicted as the basis for inferences leading to test item specifications, noting that it should enhance chances for validity over procedures that merely test knowledge about the topics involved. Parts 1 and 2 of the three part procedure (listed below) for the development of rationales are inherent in the CIT:

1. description of the behavior (definitions, delimitations, and illustration of the variety and scope of the actions included);

2. analysis of the behavior (classifying it with respect to other behaviors and making inferences about its nature);

3. formulation of item specifications (describing a specific type of item which apparently should provide a valid estimation of the specified behavior).

The CIT has been used in the development of a variety of selection devices. Flanagan (1953) describes how critical incident data can be used to construct four different types of selection procedures:

1. the biographical data inventory with items asking what the applicant has done in the past;

2. the information type of item measuring what the applicant knows about the things he has done which are directly related to behavior required by the new job;

3. multiple-choice situation items--what should be done in a described situation;

4. situational performance tests--what the applicant actually does in a realistic sample situation.

Wagner and Sharon (1951) used the CIT in the analysis of GS-7 and GS-9 Air Force Maintenance Technician jobs. The CIT data were used to evaluate the appropriateness of existing selection standards, develop multiple-choice situation test items, and to construct a behaviorally oriented reference-checking questionnaire (for completion by previous supervisors of applicants). CIT data have also been used in the development of highly structured, situational, oral interview items and role playing exercises for deputy sheriff cadet selection (1973). Flanagan (1954b) describes the use of the CIT in the development of the "job element aptitude classification tests." Kelley and Kennedy (1973) used the CIT to develop and evaluate a screening and selection device for volunteer juvenile probation officers.

The CIT has been used in the identification of behavioral criteria or dimensions for selection procedure development; for example, see Ronan, Talbert and Mullet (1977) for police officers; Roth (1961) for elementary school supervising teachers; and Wagner (1951a) for aircrew jobs. In addition, Wagner (1951b) used critical incidents to determine selection test weights.

Part and parcel of good selection practices is validation of selection procedures. It should be obvious from the previous discussion that the CIT can be used to develop both job performance criteria and selection devices essential for application of the classical validation paradigm. The CIT is central to Dunnette's

(1976) behavior validation model. Behavior validation is contrasted with classical validation because tests or item responses are correlated against ratings of behavioral dimensions of job performance instead of against global ratings of performance. The advantage of the behavior validation approach is that the more careful specification of performance requirements carries with it the potential for a more informed and less "shotgun" selection of possible predictor measures to be empirically tested against job performance criteria.

Flanagan (1953) recommends that critical incidents be classified into clearly identified and defined behavioral job elements which combine to constitute a particular job. Systematic use of such job elements could make possible the use of cumulative information regarding the predictive value of specific tests for important tasks included in a wide variety of jobs, and make possible the use of a synthetic validity paradigm linked to a critical incident job analysis.

Advantages and Disadvantages

Dunnette (1966) has high regard for the CIT: "It is a brilliant research technique--startlingly simple in conception, yet fulfilling perfectly the behavioral description requirements of our definition of job analysis" (p. 80).

The Brumback, Romashko, Hahn and Fleishman (1974) experiential evaluation of five job analysis methods generally gave the CIT high

marks. It was judged to be an operational technique with high occupational versatility and high utility throughout the three-step cycle of job analysis, test development, and test validation. It was judged to be suitable for both content and predictive validity schemes, indirectly suitable for construct validation, and to have moderate potential for synthetic validation. The sample size requirement was specified as "moderate," as was the amount of job analyst training required. In terms of reliability the CIT was rated "moderate/high." It did not always engender respondent/user acceptability, however.

Elsewhere, Brumback (1976) notes several shortcomings of the CIT for selection oriented job analysis:

> "...tasks are not described directly; KSAO's (knowledges, skills, abilities, and other personal characteristics) and trainability must be inferred from the content of the incident reports; replication may be a problem; and the method can be tedious" (p. 22).

In a comparative study of four job analysis methods containing evaluations of both experimental and experiential natures, Levine, Bennett, and Ash (1977) conclude that the CIT produces relatively strong examination plans and solid information for use in the development of job performance criteria. They note that the CIT is quite expensive relative to other methods, and that it appears relatively less versatile for purpose of job classification, compensation, and job restructuring/design.

Independent evaluations of reliability and validity aspects of the critical incident methodology were conducted by Anderson and Nilson (1964) and Ronan and Latham (1974). Both studies concluded that the reliability and content validity of the critical incident methodology are satisfactory. However, implications from the Ronan and Latham study indicate that input must be obtained from all knowledgeable observer populations if the CIT is to yield comprehensive behavioral data.

Training Availability

The authors know of no training manual, per se, for the Critical Incident Technique. However, fairly complete descriptions of variants of the CIT methodology exist in the published literature (e.g., Campbell, Dunnette, Arvey, and Hellervik, 1973; Dunnette, 1966; Flanagan, 1954a; Smith and Kendall, 1963). These descriptions have been used by many industrial psychologists and personnel specialists to apply the technique for development of performance criteria, training programs/materials, selection procedures, and for other purposes.

References

Anderson, B., & Nilson, S. Studies in the reliability and validity of the critical incident technique. Journal of Applied Psychology, 1964, 48, 398-403.

Anderson, S. D., & Anderson, N. E. Human relations training for women. Training and Development Journal, 1971, 25, 24-27.

Ash, R. A. Some current innovations in police selection. Columbus, Ohio: Ohio Department of Administrative Services, Personnel Division, December, 1973.

Brumback, G. B. One method is not enough: An overview of selection oriented job analysis methodology. Paper presented at the Selection Specialists' Symposium of the International Personnel Management Association, Chicago, July, 1976.

Brumback, G. B., Romashko, T., Hahn, C. P., & Fleishman, E. A. Model procedures for job analysis, test development, and validation. Washington, D. C.: American Institutes for Research, July, 1974.

Campbell, J. P., Dunnette, M. D., Arvey, R. D., & Hellervik, L. V. The development and evaluation of behaviorally based rating scales. Journal of Applied Psychology, 1973, 57, 15-22.

Dunnette, M. D. Personnel selection and placement. Belmont, California: Wadsworth Publishing Company, Inc., 1966.

Dunnette, M. D. Aptitudes, abilities, and skills. In Dunnette, M. D. (Ed.) Handbook of industrial and organizational psychology, Chicago: Rand McNally College Publishing Company, 1976.

Fivars, G. The critical incident technique: A bibliography. Palo Alto, California: American Institutes for Research, 1973.

Flanagan, J. C. The use of comprehensive rationales in test development. Educational and Psychological Measurement, 1951, 11, 151-155.

Flanagan, J. C. Improving personnel selection. Public Personnel Review, 1953, 14, 107-112.

Flanagan, J. C. The critical incident technique. Psychological Bulletin, 1954a, 51, 327-358.

Flanagan, J. C. Job element aptitude classification tests. Personnel Psychology, 1954b, 7, 1-14.

Flanagan, J. C. Leadership skills: Their identification, development, and evaluation. In Petrullo, L. and Bass, B. M. Leadership and interpersonal behavior. New York: Holt, Rinehart and Winston, Inc., 1961.

Fleming, J. W. The critical incident technique as an aid to in-service training. American Journal of Mental Deficiency, 1962, 67, 41-52.

Goodale, J. G., & Burke, R. J. Behaviorally based rating scales need not be job specific. Journal of Applied Psychology, 1975, 60, 389-391.

Hahn, C. P. The development and validation of situational problems for training in those leadership behaviors essential for effective performance as a junior officer. Washington, D. C.: American Institutes for Research, 1956.

Kelley, T. M., & Kennedy, D. B. Validation of a selection device for volunteer probation officers. Journal of Criminal Justice, 1973, 1, 171-172.

Landy, F. J., Farr, J. L., Saal, F. E., & Freytag, W. R. Behaviorally anchored scales for rating the performance of police officers. Journal of Applied Psychology, 1976, 61, 750-758.

Latham, G. P., & Wexley, K. N. Behavioral observation scales for performance appraisal purposes. Personnel Psychology, 1977, 30, 255-268.

Levine, E. L., Bennett, L. J., & Ash, R. A. Exploratory comparative study of four job analysis methods. Selection Resource Center Research Report No. 20. Phoenix: State of Arizona Department of Administration, Personnel Division, February, 1977.

Miller, R. B., & Folley, J. D., Jr. The validity of maintenance job analysis from the prototype of an electronic equipment. Pittsburgh: American Institute for Research, 1952.

Ronan, W. W. Training for emergency procedures in multi-engine aircraft. Pittsburgh: American Institute for Research, 1953.

Ronan, W. W., & Latham, G. P. The reliability and validity of the critical incident technique: A closer look. Studies in Personnel Psychology, 1974, 6, 53-64.

Ronan, W. W., Talbert, T. L., & Mullet, G. W. Prediction of job performance dimensions: Police officers. Public Personnel Management, 1977, 6, 173-180.

Roth, L. H. Selecting supervising teachers. Journal of Teacher Education, 1961, 12, 476-481.

Smith, P. C., & Kendall, L. M. Retranslation of expectation: An approach to the construction of unambiguous anchors for rating scales. Journal of Applied Psychology, 1963, 47, 149-155.

Suttell, B. J., & Richlin, M. Development of situational performance problems for evaluating and training potential Navy junior officers. Officer Personnel Research Program Memorandum No. 29. Washington, D. C.: American Institute for Research, 1954.

Wagner, C. E., & Sharon, M. I. Defining job requirements in terms of behavior. Personnel Administrator, 1951, 14, 18-25.

Wagner, R. F. Using critical incidents to determine selection test weights. Personnel Psychology, 1951, 4, 373-381. (a)

Wagner, R. F. Development of standardized procedures for defining the requirements of aircrew jobs in terms of testable traits. USAF School of Aviation Medicine, 1951, Project No. 21-29-010, No. 1. (b)

Zedeck, S., & Baker, H. T. Nursing performance as measured by behavioral expectation scales: A multitrait-multirater analysis. Organizational Behavior and Human Performance, 1972, 7, 457-466.

Chapter 6

REVIEW OF THE POSITION ANALYSIS QUESTIONNAIRE

Contents

Description

The Position Analysis Questionnaire (PAQ) is a structure job analysis questionnaire consisting of 194 job elements, or items. The first 187 items relate to job activities or the work situation, while the last seven report the type of compensation received by incumbents on the job.

The PAQ job elements are "worker-oriented" rather than "job-oriented." That is, worker-oriented elements tend to characterize the generalized human behaviors involved in work activities, or what the worker does to accomplish the end result of his actions. Job-oriented elements, on the other hand, are descriptions of job content that typically describe what is accomplished by the worker, and characterize the technological aspects of jobs (McCormick, 1959).

The elements are organized into six divisions. The first three (Information Input, Mental Processes, and Work Output) represent a stimulus-organism-response frame of reference in thinking about three major aspects of virtually any job. Generally, a person obtains information from one or more sources in the work environment, uses that information along with information which has been learned previously, and performs some physical activity resulting in some type of work output.

Division 4 (Relationships With Other Persons) elements provide for the analysis of interpersonal aspects of jobs such as the nature of

communications, the types of persons with whom the incumbent communicates, and supervisory-subordinate relationships. Division 5 (Job Context) provides for describing the work situation or environment within which the individual works. Division 6 (Other Job Characteristics) consists of a variety of job elements which do not lend themselves to being classified in the other divisions.

The PAQ authors feel the organizing the instrument into the six divisions provides the job analyst with a logical approach to the analysis of any given job. Specific PAQ job analysis data are usually collected in one of two ways. Preferably, a trained job analyst (or other staff person who has gained sufficient familiarity with the PAQ) will observe the job being performed in the work setting, interview an experienced job incumbent, and review the information obtained and impressions formed with the immediate supervisor. The interview should begin with a general description of the job by the incumbent, with the analyst making notes on the main job duties and tasks. Next, the analyst should proceed sequentially through th PAQ, asking the incumbent about the individual job elements. If an element applies, the analyst would ask for a detailed explanation of the way in which it applies. Then the analyst makes a judgment about the rating to be given the element, and marks that rating on the computer-scored PAQ Record Form.

For professional, managerial, supervisory, office jobs, and the like (generally "white collar" jobs) the job analysis data can be collected directly from incumbents and supervisors who complete the PAQ. When this

procedure is used, the PAQ authors recommend that considerable guidance be provided by someone who is very knowledgeable about job analysis and the PAQ. This expert would serve as a discussion leader to interpret the PAQ items in terms directly related to the jobs being analyzed for those incumbents and supervisors who actually complete PAQs. When using this procedure it is desirable to have three of four incumbents who hold the same job plus the supervisor of the job, complete separate PAQs independently. This allows for a reliability check of the data, and computation of composite (average) answers for each PAQ item which can serve as the final job analysis data. This method is generally not recommended for "blue collar" jobs/employees due to the relatively high verbal ability required to read and understand the PAQ (Ash and Edgell, 1975).

The job element ratings are then used to derive job dimension scores for individual positions or jobs undergoing analysis. (The completed PAQ Record Forms are computer-scored by PAQ Services, Inc., Logan, Utah.) Two types of job dimension scores can be obtained. One type consists of dimensions based on "attribute" profiles of the individual job elements; the other consists of dimensions based on "job data."

The attribute-based job dimensions stem from psychologists' ratings of the relevance of each of 76 human attributes to each of the PAQ job elements (McCormick, Jeanneret, and Mecham, 1972; Marquardt and McCormick, June, 1974a). Forty-nine of these are aptitudes (e.g., Mechanical Ability, Perceptual Speed, Arithmetic Reasoning); the other attributes are

situational in nature, requiring the job incumbent to adapt to a specified situation (e.g., dealing with things/objects, pressure of time, dealing with people).

The job-data-based job dimensions were derived by means of a factor analytic technique (principal components analysis with a varimax rotation of obtained components). The job elements within each of the six divisions of the PAQ were subjected to this type of analysis, resulting in "division" job dimensions. Most of the job elements were also pooled for another principal components analysis, resulting in "overall" job dimensions. PAQ System II is based on the analyses described above for 2200 jobs considered to be representative of the occupational composition of the American labor force (Mecham, 1977). The System II job dimensions are listed in Table 1. The job dimension scores are used to characterize individual jobs and in all subsequent analysis of PAQ data.

Uses

McCormick, Mecham, and Jeanneret (1977) identify the following potential uses for System II of the PAQ:

1. prediction of aptitude requirements for jobs,
2. job evaluation and setting compensation rates,
3. job classification.

The concept of job component validity (more commonly, but less descriptively, referred to as "synthetic" validity) is central to

Table 1

PAQ System II - Division Job Dimensions

Division 1 - Information Input

1. Interpreting what is sensed
2. Using various sources of information
3. Watching devices and/or materials for information
4. Evaluating and/or judging what is sensed
5. Being aware of environmental conditions
6. Using various senses

Division 2 - Mental Processes

7. Making decisions
8. Processing information

Division 3 - Work Output

9. Using machines and/or tools and/or equipment
10. Performing activities requiring general body movements
11. Controlling machines and/or processes
12. Performing skilled and/or technical activities
13. Performing controlled manual and/or related activities
14. Using miscellaneous equipment and/or devices
15. Performing handling and/or related manual activities
16. General physical coordination

Division 4 - Relationships With Other Persons

17. Communicating judgments and/or related information
18. Engaging in general personal contact
19. Performing supervisory and/or coordinating and/or related activities
20. Exchanging job-related information
21. Public and/or related personal contacts

Division 5 - Job Context

22. Being in a stressful and/or unpleasant environment
23. Engaging in personally demanding situations
24. Being in hazardous job situations

Division 6 - Other Job Characteristics

25. Working on non-typical vs. day schedule
26. Working in a businesslike situation
27. Wearing specified vs. optional apparel
28. Being paid on a salary vs. variable basis
29. Working on an irregular vs. regular schedule
30. Working under job-demanding circumstances
31. Performing unstructured vs. structured work
32. Being alert to changing conditions

Table 1 (continued)

PAQ System II - Overall Job Dimensions

33. Having decision, communicating, and general responsibilities
34. Operating machines and/or equipment
35. Performing clerical and/or related activities
36. Performing technical and/or related activities
37. Performing service and/or related activities
38. Working regular day vs. other work schedules
39. Performing routine and/or repetitive activities
40. Being aware of work environment
41. Engaging in physical activities
42. Supervision/directing/estimating
43. Public and/or customer and/or related contacts
44. Working in an unpleasant/hazardous/demanding environment
45. Not named

identification of aptitude requirements for jobs with the PAQ. The basic assumption of job component validity is that the human requirements of any given job activity (component) would be comparable in the case of any job in which that same activity occurred. Balma (1959) identified the following steps in establishing a job component validity system:

1. analysis of jobs into their elements,
2. determination of test validity for those elements,
3. combination of elemental validaties into a whole for a specific job.

The PAQ System parallels Balma's schema. The PAQ job elements, given their human behavior orientation, serve as the "common denominators" in the analysis of virtually any type of job. The determination of test validity for these job elements (or their combinations) has been accomplished in several studies for both the General Aptitude Test Battery (GATB) of the United States Employment Service (USES) (Marquardt and McCormick, 1974; McCormick, Jeanneret, and Mecham, 1972) and certain commercially available tests (McCormick, DeNisi, and Shaw, 1977).

Operationally, the PAQ job dimension scores (for a particular job) are put through a series of multiple regression equations to derive the following predictions for each GATB test:

1. mean test score,
2. one standard deviation below the mean test score ("cutoff score"),

3. validity coefficient,

4. use in selection.

This latter index is an estimate as to whether a test would likely be used by the USES in a final battery for a job such as this. In a criterion-related validity study, four of the five GATB variables identified through PAQ job analyses as being important to a group of jobs subsequently correlated substantially with measures of training success (Ash, 1978).

The PAQ approach to job evaluation has been used in a variety of industries and locations and often replaced more conventional approaches because of the greater efficiency and objectivity inherent in the technique (McCormick, Mecham, and Jeanneret, 1972). An early study indicated that a prespecified combination of System I job dimension scores was substantially predictive of going rates of pay for a sample of jobs (Mecham and McCormick, 1969). Data for 340 jobs from 45 varied organizations were used to identify the relationship between PAQ job dimension scores and going rates of compensation. (Cross validation coefficients of .85 and .83 were obtained in the double cross-validation study.) The sample included jobs in most major occupational categories. Due to inflation, the predicted monthly compensation rates are now considered as "job evaluation points" rather than dollars, and reflect the relative hierarchy between and among jobs.

A subsequent analysis of data for a similar sample of 850 jobs produced a multiple correlation coefficient of .85. A study involving

79 jobs in a major insurance company resulted in PAQ predicted values that correlated with actual salary rates at r = .93 (Taylor, 1978). In addition, it is possible (in some instances) to use PAQ job dimension scores to derive "unique" equations that reflect the compensation policy of individual organizations or the going rate within specific labor markets. Additional studies are discussed by McCormick, Mecham, and Jeanneret (1977).

For job classification purposes, PAQ analyses of various jobs within an organization provide data for understanding the relationships between and among those jobs. Basically, the 13 overall job dimension scores (of the jobs under study) are used in profile comparison or pattern analysis to group jobs into basic families or clusters. The job families make it possible to identify the patterns of work functions that comprise each job family. McCormick et al. (1977) report that the procedure sometimes results in the grouping of jobs into job families on the basis of reasonably similar profiles, but whose titles would not have suggested such groupings. These data can be useful in consolidating or systematizing job titles as deemed appropriate, (or in identifying job titles as deemed appropriate), or in identifying jobs assumed to be similar because of titles or classifications, but which, in fact, have somewhat different job behavior profiles. In a recent series of studies (Taylor, 1978; Taylor and Colbert, 1978; Colbert and Taylor, 1978) job analysis information derived from the PAQ was used to form homogeneous job families

within which selection test validity was and can be generalized. Cornelius, Hakel, and Sackett (1979) used a modified version of the PAQ to classify U. S. Coast Guard jobs for the purpose of developing performance appraisal instruments.

The PAQ has also been used in other types of occupational research. Lounsbury, Spurlin, and Ridley (1976) developed 17 performance appraisal items corresponding to relevant PAQ job dimensions for use in a validation study of aptitude tests for clerical employees. The performance ratings for all 17 elements were essentially normally distributed; however, this appeared to be a function of the rating scale format rather than the performance dimensions rated. Also, interrater reliability of the performance ratings was low ($r \leq .50$).

Mecham, McCormick, and Jeanneret (1977) used the 13 PAQ System II overall job dimensions in the prediction of job prestige. Several indexes of job prestige were found to be highly correlated, and the constructs, prestige, was predicted with considerable accuracy from the nature of the job as measured by the PAQ. Job prestige was found to be associated with higher levels of ability requirements across the spectrum of ability as measured by the General Aptitude Test Battery. In redesigning jobs to make them more prestigious (job enrichment), organizations must be careful in order to avoid upgrading the ability requirements beyond the ability levels of incumbents.

Advantages and Disadvantages

To the authors' knowledge, two reasonably objective comparisons of various recognized job analysis methods have been made. Brumback, et al. (1974) used five methods in analyzing three jobs, and offered "tentative," experiential evaluation of the methods on a number of factors.

The PAQ was judged to be a highly standardized, operational, off-the-shelf technique, with high occupational versatility. The respondents and users (firemen, investigators, and researchers) readily accepted the technique. Only a very minimal number of job incumbents needed to be interviewed for analysis of any particular job. PAQ results generally enjoyed high reliability. The amount of job analyst training time was specified as "low/moderate." This is a particularly accurate estimate in the case of analysts already proficient in job analysis in general. In terms of selection procedure development/validation, the PAQ was judged as being suitable for establishing both predictive and construct validity, but not suitable for establishing content validity.

Levine, Bennett, and Ash (1977) conducted an experimental comparative study of four job analysis methods across four jobs. The experimental aspects of the study were confined to job analysis for selection purposes, but experiential evaluations of applications to other areas were also made.

The PAQ cost significantly less than the other methods studied. It was also determined to have high versatility, in that the resulting data base would be useful for classification, compensation, job restructuring, the formation of homogeneous job clusters, and in personnel selection. However, the PAQ was not considered to have high utility for performance appraisal. In contrast with the Brumback et al. (1974) evaluation, Levine et al. (1976) concluded that the PAQ would be somewhat more difficult to install in an organization (as compared to other methods studied) since resistance would likely be encountered from those who would have to use it. Both studies agreed that it would be difficult to defend the use of the PAQ for establishing content validity of selection procedures.

Training Availability

Three "training" manuals are available dealing with System II of the PAQ. The PAQ Technical Manual (McCormick, Mecham, and Jeanneret, 1977) includes a discussion of the nature of the PAQ, some background regarding its development, a summary of some of the research carried out with it, and a discussion of certain of its potential applications. The PAQ Job Analysis Manual (PAQ Services, Inc., 1977) provides guidelines and assistance to those individuals who will actually be analyzing jobs with the PAQ. It includes detailed discussions of the PAQ rating scales, the various techniques for administering the PAQ by several types of analysts, and specific suggestions for preparing and conducting

the job analysis interviews. It also contains a detailed discussion and examples of ratings on several occupations for the majority of PAQ job elements. The PAQ Users Manual (Mecham, McCormick, and Jeanneret, 1977) describes the various computer options that are available, and information useful in interpreting the computer printouts. All three manuals are distrubuted through:

University Book Store
360 West State Street
West Lafayette, Indiana 47906

Training and assistance in use of the PAQ System are available from personnel of PAQ Services, Inc. The personnel can be reached at three separate geographic locations:

Dr. Earnest J. McCormick
1315 Sunset Lane
West Lafayette, Indiana 47906

Dr. Robert C. Mecham
P. O. Box 1358, UMC 101
Utah State University
Logan, Utah 84322

Dr. P. R. Jeanneret
1127 Kingsbridge Road
Houston, Texas 77070

References

Ash, R. A. Job analysis and test development for power plant entry level personnel selection. Paper presented at the American Public Power Association Engineering and Operations Workshop, San Francisco, March, 1978.

Ash, R. A., & Edgell, S. L. A note on the readability of the Position Analysis Questionnaire (PAQ). Journal of Applied Psychology, 1975, 60, 765-766.

Balma, M. J. The concept of synthetic validity. Personnel Psychology, 1959, 12, 395-396.

Brumback, G. B., Romashko, T., Hahn, C. P., & Fleishman, E. A. Model procedures for job analysis, test development, and validation. Washington, D. C.: American Institutes for Research, July, 1974.

Colbert, G. A., & Taylor, L. R. Empirically derived job families as a foundation for the study of validity generalization: Study III. Generalization of selection test validity. Personnel Psychology, 1978, 31, 355-364.

Cornelius, E. T., III, Hakel, M. D., & Sackett, P. R. A methodological approach to job classification for performance appraisal purposes. Personnel Psychology, 1979, 32, 283-297.

Levine, E. L., Bennett, L. J., & Ash, R. A. Exploratory comparative study of four job analysis methods. (Selection Resource Center Research Report #20). Phoenix: State of Arizona Department of Administration, Personnel Division, February, 1977.

Lounsbury, J. W., Spurlin, O., & Ridley, J. R., Jr. TVA test validation project aptitude tests for clerical employees. Projects and Systems Management, Tennessee Valley Authority, Report No. 1. Knoxville, Tennessee, March, 1976.

Marquardt, L. D., & McCormick, E. J. The job dimensions underlying the job elements of the Position Analysis Questionnaire (PAQ) (Form B). Purdue University, Department of Psychological Sciences, Occupational Research Center, Report No. 4, June, 1974.

Marquardt, L. D., & McCormick, E. J. The utility of job dimensions based on Form B of the Position Analysis Questionnaire (PAQ) in a job component validation model. Purdue University, Department of Psychological Sciences, Occupational Research Center, Report No. 5, July, 1974.

McCormick, E. J. The development of processes for indirect or synthetic validity: III. Application of job analysis to indirect validity, A symposium. Personnel Psychology, 1959, 12, 402-413.

McCormick, E. J., DeNisi, A. S., & Shaw, B. J. Job-derived selection: Follow up report. Purdue University, Department of Psychological Sciences, Report No. 4, May, 1977.

McCormick, E. J., Jeanneret, P. R., & Mecham, R. C. A study of job characteristics and job dimensions as based on the Position Analysis Questionnaire (PAQ). Journal of Applied Psychology, 1972, 56, 347-368.

McCormick, E. J., Mecham, R. C., & Jeanneret, P. R. Technical manual for the Position Analysis Questionnaire (PAQ) (System II). Logan, Utah: PAQ Services, Inc., 1977.

Mecham, R. C. Unpublished report. Logan, Utah: PAQ Services, P. O. Box 3337, February, 1977.

Mecham, R. C., McCormick, E. J., & Jeanneret, P. R. Users manual for the Position Analysis Questionnaire (PAQ) (System II). Logan, Utah: PAQ Services, Inc., 1977.

Mecham, R. C., & McCormick, E. J. The use in job evaluation of job elements and job dimensions based on the Position Analysis Questionnaire. Purdue University, Department of Psychological Sciences, Occupational Research Center, Report No. 3, June, 1969.

PAQ Services, Inc. Job analysis manual for the Position Analysis Questionnaire (PAQ). Logan, Utah: PAQ Services, Inc., 1977.

Taylor, L. R. Empirically derived job families as a foundation for the study of validity generalization: Study I. The construction of job families based on the component and overall dimensions of the PAQ. Personnel Psychology, 1978, 31, 325-340.

Taylor, L. R., & Colbert, G. A. Empirically derived job families as a foundation for the study of validity generalization: Study II. The construction of job families based on company-specific PAQ job dimensions. Personnel Psychology, 1978, 31, 341-353.

Chapter 7

REVIEW OF THE JOB ELEMENT METHOD

Contents

Introduction

The Job Element Method (JEM) is a procedure for analyzing jobs which focuses on the human attributes necessary for superior performance on the job. The method was developed by Ernest Primoff of the United States Civil Service Commission and since its development has been used in a variety of settings.

The Job Element Method can be contrasted with other job analysis procedures in that it bypasses the task information or descriptions of the work itself, and goes directly to the job elements. Primoff (1975) has defined job elements as characteristics of superior workers. Some examples of job elements are:

- a knowledge, such as the knowledge of investigation techniques or knowledge of court procedures;
- a skill, such as skill in the use of firearms or skill in conducting interviews;
- an ability, such as the ability to solve problems or the ability to communicate orally;
- a willingness, such as the willingness to work rotating shifts or the willingness to work with the public; or
- a personal characteristic, such as stress tolerance, flexibility, or perseverance.

The JEM can also be compared with other job analysis methods in that it relies on the knowledge of subject matter experts (i.e., job incumbents and supervisors) to derive job analysis information rather than the observations and/or data collection of job analysts. Initially, data

collection for the JEM was comprised of interviews conducted by job analysts with subject matter experts. Subsequent work indicated, however, that the job analysis could be performed by utilizing supervisors and expert workers. For this reason the data collection phase of the JEM has evolved into group meetings or "panel sessions" of subject matter experts, which has proven to be a more efficient method for collecting data than individual interviews.

Data Collection

The first step in the data collection for the JEM involves the identification of subject matter experts who will be panel members in the job analysis rating session. Typically these are supervisors and experienced workers "who, through supervision or through experience as expert workers, know the requirements of the job" (Primoff, 1975, p. 7). It is believed that by observing subordinates or fellow workers over time, the subject matter expert has the opportunity to obtain an understanding of the elements required on the job. For example, an experienced police officer would observe such attributes as the ability to follow instructions or skill in the use of hand guns being used by fellow officers on the job. Therefore, such a person would be able to accurately identify and rate the job elements required for superior performance as a police officer. In addition, the use of job incumbents and supervisors is considered efficient because it is assumed that it would take a great deal of observation by a job analyst to obtain a complete understanding of the job and job elements.

Primoff (1975) cautions that one should consider biases and attitudes when selecting panel members:

> Panel members who have already made up their minds as to elements are unsuited to evaluate the applicability of elements. The members of the panel should be interested in maintaining a high standard of proficiency, and should have an open mind toward different ways of measuring potential proficiency (p. 7).

With regard to the experience level of the raters, Primoff (1975) states:

> The raters must have enough experience to know the requirements of the job, and to know the characteristics of both newly hired and experienced employees. In the case of a new job, it is critical to select raters who know the most about the job. This will probably include at least the supervisor responsible for setting up the new job (p. 7).

Although there are variations of the JEM, the general procedure for data collection consists of two phases, job element generation and job element rating. Each is described below.

Element and Subelement Generation

To produce a list of required job elements, the job analyst meets with several subject matter experts, usually about six. It should be mentioned that the role of the job analyst in this session is merely that of a catalyst--acting to keep the group on tract and to facilitate the generation of the elements.

The purpose of the job analysis study and the panel session is explained to the participants and they are then asked to list the elements necessary for job performance. Subsequently, participants are

asked to generate subelements which are more specific worker characteristics and which relate to the broader elements.

Rating Session

Using the list of job elements and subelements produced in the preceeding step, panel participants rate each element and subelement on four criterion categories. These are:

Barely Acceptable (B): What relative portion of even barely acceptable workers are good in the element?

Superior (S): How important is the element in picking out the superior worker?

Trouble (T): How much trouble is likely if the element is ignored when choosing among applicants?

Practical (P): Is the element practical? To what extent can we fill our job openings if we demand it?

To rate the job elements, participants are given a standard worksheet, the Job Element Blank. A copy of this form is presented in Table 1. Job elements are then rated on the four categories, assigning each element a rating of "0," "1," "2."

As an example consider the job of police officer. If all barely acceptable police officers possess the "ability to drive safely," that element would receive a rating of "2" on the B scale. If some, but not all of the barely acceptable workers possess the element, it would be rated as "1"; if none possesses the element, a rating of "0" would be assigned.

The element is then rated on its ability to pick out superior workers. If the element is very important in differentiating between

Table 1

JOB ELEMENT BLANK

Page No. ___ ___
(col. 1 2)

Job:
Grade:

Rater Name and Grade:
Title and Location:

Rater No. ___ ___ ___ (col. 3 4 5)

Job No. ___ ___ ___ (6 7 8)

Date:

Element No. (Do not Punch)	Barely acceptable workers (B) + all have ✓ some have 0 almost none have	To pick out superior workers (S) + very important ✓ valuable 0 does not differentiate	Trouble likely if not considered (T) + much trouble ✓ some trouble 0 safe to ignore	Practical. Demanding this element, we can fill (P) + all openings ✓ some openings 0 also no openings	Columns	(These columns for use in hand calculation of values) S×P	T	Item Index (IT) SP+T	Total Value (TV) IT+S−B−P	P′ (+=0 ✓=1 0=2)	SP′	Training Value (TR) S+T+SP′−B
					9–12							
					13–16							
					17–20							
					21–24							
					25–28							
					29–32							
					33–36							
					37–40							
					41–44							
					45–48							
					49–52							
					53–56							
					57–60							
					61–64							
					65–68							
					69–72							
					73–76							
					77–80							

U.S. Civil Service Commission
Personnel Research and Development Center
Washington, D.C.

Note: for all categories except P′, + counts 2, ✓ counts 1, 0 counts 0. For category P′, + counts 0, ✓ counts 1, 0 counts 2.

the superior and barely acceptable worker, it would be given a rating of "2" on the S scale. The element would receive a rating of "1" if it differentiated somewhat between superior and barely acceptable and a "0" if it was not important in picking out the superior worker. As an example, the "ability to breathe" would be given a "0" rating in this category, since both superior and barely acceptable workers possess this element.

For the Trouble Likely, or T scale, the elements are analyzed in terms of the trouble that could be expected if the element is not given special consideration in the selection process. An example for the job of police officer would be "emotional control." Although recruits may be competent in other required elements, a low level of emotional control might lead to more incidents of "unnecessary force," or allegations of police brutality. For this reason, the element would be given a rating of "2" on the T scale. Conversely, and element such as "knowledge of geographic area" would be learned on the job and would, therefore, be given a low rating on the T scale.

The Practical, or P scale, is based on the likelihood of job applicants' possessing an element. That is, how easy would it be to fill the job openings if the element were required of all applicants? Using the example of a police officer again, it would be practical to expect that most applicants would possess the ability to drive safely, giving this element a rating of "2" or "1," whereas it would be unlikely that applicants would possess a knowledge of laws and statutes, resulting in a rating of "0" on the P scale.

Data Analysis

The data collected during the rating session serve as the basis for calculating several values, which provide information about the individual elements. Group sums for each of the four categories (i.e., Barely Acceptable, Superior, Trouble Likely, and Practical) are produced by adding individual ratings in each category.

Primoff (1975) has discussed the meaning of these overall totals.

> A high Barely Acceptable value indicates that most barely acceptable workers are satisfactory in the element. A high Superior value indicates that the element is important in selecting superior employees. A high Trouble Likely value indicates that the element is a consideration, especially at the lower end of ability; applicants weak in the ability may be very weak employees (p. 16).

Individual ratings are used to compute three additional ratings--the Item Index (IT), the Total Value (TV), and the Training Value (TR). The Item Index (IT) is an indication of how valuable the element will be for selecting superior workers. The first step in calculating the IT value is to multiply the Superior (S) value by the Practical (P) value on each individual job element blank. The reasoning behind this calculation is that the Superior rating for each element must be considered in relation to whether it is practical to expect job applicants to possess that attribute. To produce the final IT value, the product of S and P is added to the rating on the T-scale. The formula for this index is as follows:

IT	=	(S	X	P)	+	T
Item Index of the Element	=	Superior rating	X	Practical rating	+	Trouble Likely rating

The Total Value (TV) differentiates elements, which are broad, from subelements, which are relatively narrow. The formula, based on providing the maximum differentiation between Superior and Barely Acceptable, is as follows:

TV	=	IT	+	S	-	B	-	P
Total Value of an Element	=	Item Index of an Element	+	Superior rating	-	Barely Acceptable rating	-	Practical rating

Items with high TV values are considered major elements of a job and, as such, too broad to allow applicants to describe their abilities in these areas with precision (Primoff, 1975). For this reason, subelements are used in the selection process to allow for a more accurate and precise assessment of job candidates.

The final calculation made is the Training Value (TR) which is an indication of whether the element would be a valuable subject for a training program. That is, this calculation identifies those elements which are high on Superior and Trouble Likely and low on Practical and Barely Acceptable.

The first step in calculating the Training Value is to reverse the rating on the Practicality scale (so that elements which almost no applicants possess are given a rating of 2 rather than 0). This value

is then multiplied by the Superior rating which places high values on those elements which are high in Superior but low in Practical. It is these elements which distinquish superior workers but which are not readily found in the applicant pool. In other words, if a worker needs an element to be superior on the job but no one in the applicant pool possesses that element (e.g., knowledge of laws and statutes for police officers), a training program to provide that element to workers should be developed and implemented. The formula for the Training Value is as follows:

TR	=	S	+	T	+	SP	-	B
Training Value of Element	=	Superior rating	+	Trouble Likely rating	+	Product of Superior and reversed Practical rating	-	Barely Acceptable rating

It should be noted that the formulas for calculating the three values discussed above were developed empirically in a predictive, criterion related validation study. Examination ratings of applicants on elements were correlated with measures of subsequent job performance. Based on these data, multiple regression weights were calculated for the four ratings (i.e., Barely Acceptable, Superior, Trouble Likely, and Practical) to predict job success (Primoff, 1975).

Because group sums will be affected by the size of the panel used in the data collection phase, Primoff (1975) has developed a method for transmuting group sums of the four scales. In addition, he provides

a method for transmuting group sums for the Total Value and the Training Value. A computer program for the job element method has been developed and it provides transmuted values.

Primoff (1975) gives rationales for identifying elements as major elements, subelements, "knockout" or screenout elements and elements for training based on the transmuted values of each of the seven scales. Decisions regarding which elements should be discarded, which should be part of the selection procedure, and which should be included in a training program are all made on the basis of the calculations described above.

Uses

Selection

The predominant use of the JEM has been for development of selection procedures. Used extensively by the U.S. Civil Service Commission to develop exams for trades, it has also been used to establish selection standards for law enforcement officers. For example, the JEM has been used to set physical fitness requirements for police officers (Braaten, 1975) and to develop general minimum qualifications for peace officers (Georgia Peace Officer Standards and Training Council, 1977).

Typically, selection procedures developed from the JEM are validated by empirical methods, such as concurrent or predictive validation. A possible alternative to conducting criterion-related validation studies is job-component, or synthetic validation. The basic idea behind synthetic validity is that once one identifies the human attributes required for the

job, and the importance of each of these attributes to success on the job, then one should be able to identify how well a test which measures these attributes will predict job success.

One approach to synthetic validity is that of the J-coefficient, developed by Primoff (1959), and tied to the JEM. Essentially, the procedure for calculating the J-coefficient involves finding out to what extent the elements in the test and the elements in the job overlap, and the importance of the elements for success on the job.

In several research studies, J-coefficients were calculated and compared to actual validity coefficients obtained in criterion-related validation studies. The results show the J-coefficient to be related to the validity coefficients (Primoff, 1959), and a "reasonably satisfactory method for developing test batteries" (McCormick, 1976).

Training

As mentioned earlier, the Training Value of an element can be determined by the JEM and, consequently, the subject matter for training programs can be determined from this value. In a 1977 study of peace officers in Georgia a modified JEM was used, including a fifth category called "when element is usually acquired." This modification revealed that 45 percent of the knowledge, skill, and abilities of the peace officers are acquired on the job, while another 44 percent are acquired during basic training (Georgia Peace Officer Standards and Training Council, 1977).

In another study, the JEM was used to determine the training needs of auditors employed by the General Auditing Office of the U.S. Government (Organt, 1979). To do this, investigators calculated the Training Value of each job element, reviewed related training programs and courses which were available, and determined the existing level of the job element possessed by the target group. With this information Organt (1979) developed a decision grid of recommendations for using elements for selection or training as well as recommendations as to the most appropriate training methods.

Performance Appraisal

Although not used for this purpose very frequently, Primoff (1978) reports that developing performance appraisal instruments based on important elements and using them in conjunction with a self-appraisal system may hold promise. Although the results from the few research studies conducted are not conclusive, having workers evaluate themselves on important elements, as well as having their supervisors rate them on the same elements, seems to lead to a reduction in grievances and appeals. Other conditions, such as the commitment of interested management may also be necessary, but the results seem to be promising.

Potential for Other Uses

As far as other uses, such as job description, classification, and design, the JEM is relatively weak. Since these uses are either task-related, or aimed at the similarities between jobs, the JEM with its

emphasis on differences between elements and the "bypassing" of tasks is not as useful as some of the other job analysis methods.

It does have some utility for determining safety problems, as these will usually turn up in the Trouble Likely value. Again, the lack of concern for tasks makes translating this scale value into "what can be done to make the job safer?" a difficult question to answer.

The JEM does have some promise for the area of worker mobility. By knowing the elements necessary for successful performance in various jobs, optimal matching between workers and jobs can be accomplished when workers' strengths and weaknesses are taken into account.

Advantages and Disadvantages

In a paper presented in 1976, Brumback comments that the Job Element Method is "...almost too unwieldy and unstructured...in the initial stage of soliciting preliminary job elements for subject matter experts" (p. 19). Brumback (1976) also points to the "absence of operational definitions...of the KSAO's it generates," and its failure to "identify tasks or the frequency and difficulty of the KSAO's" as two more shortcomings of this job analysis technique.

A logistical problem involves getting the subject matter experts together for the panel sessions. When dealing with higher level personnel or police personnel, the schedules of the panel members frequently will not mesh, making scheduling of a panel session very difficult.

Also, taking six supervisors or expert workers away from their jobs at the same time may be quite impractical in some smaller organizations.

In an experiential study of five job analysis methods (Brumback, Romashko, Hahn, and Fleishman, 1974), the JEM received generally good ratings. It was judged as having high occupational versatility, and rated "moderate" on its utility throughout the job analysis-test development-test validation process. The JEM was judged as having good user acceptability, a moderate/high potential for synthetic validity, moderate reliability, and as generally suitable for content and predictive validation studies. The sample size requirement of the JEM was rated as "minimal" and the amount of job analyst training required was judged to be "moderate."

In fact, the only dimensions on which the JEM received unsatisfactory marks were in its suitability for construct validation and its lack of standardization. Brumback et al. (1974) state, "The job element approach can only be conceived as a means of directly determining constructs if one is willing to regard the panelists' spontaneously mentioned elements...as psychological traits in the usual theoretical or psychometric sense. Perhaps if the panelists were all psychologists, the elements would be closer approximations to constructs, but not necessarily more relevant as job elements..." (p. 105).

In a comparative study of four job anlaysis methods containing both experimental and experiential evaluations, Levine, Bennett, and Ash (1977) found that their study participants were quite familiar with

the JEM prior to the outset of the study. When judging job analysis reports developed using the various methods, those which used the JEM were rated most favorably, although this may be due in part to the judges familiarity with JEM reports. With regard to the cost of conducting the job analysis for the four classes being studied, only the Position Analysis Questionnaire was less expensive. Exam plans developed from the JEM were rated as lower in quality than those developed from a critical incidents approach, but were judged to be of approximately the same quality as the plans developed using the PAQ and Task Analysis methods. Overall ratings by the researchers in the study found that of the four methods investigated the JEM was the easiest to learn and the quickest to implement.

Training Availability

Primoff (1975) offers a detailed description of the job elements method. This volume describes the method itself as well as the techniques for data collection, data analysis, and development of examination plans. Also included is the job element values computer program which produces the seven element values. This volume, entitled How to Prepare and Conduct Job Element Examinations, is available from the U.S. Government Printing Office.

References

Braaten, T. A. The analysis of physical abilities and the development of physical fitness measurements to aid in the selection of police applicants for the City of Saginaw Police Department. Saginaw, Michigan: Saginaw Police Department, 1975.

Brumback, G. B. One method is not enough: An overview of selection oriented job analysis methodology. Chicago: Paper presented at the Selection Specialists' Symposium of the International Personnel Management Association, July, 1976.

Brumback, G. B., Romashko, T., Hahn, C. P., & Fleishman, E. A. Model procedures for job analysis, test development, and validation. Washington, D. C.: American Institutes for Research, July, 1974.

Georgia Peace Officer Standards and Training Council. A job analysis of entry level peace officers in Georgia: Phase I report, project careers. Atlanta, Georgia: 1977.

Levine, E. L., Bennett, L. J., & Ash, R. A. Exploratory comparative study of four job analysis methods. (Selection Resource Center Research Report No. 20) Phoenix: State of Arizona Department of Administration Personnel Division, February, 1977.

McCormick, E. J. Job and task analysis. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology. Chicago: Rand McNally College Publishing Co., 1976.

Organt, G. J. Task competency based training needs assessment. San Diego, California: Paper presented at the annual conference of the International Personnel Management Association Assessment Council, June, 1979.

Primoff, E. S. Empirical validations of the J-coefficient. Personnel Psychology, 1959, 12, 413-418.

Primoff, E. S. How to prepare and conduct job element examinations. (Technical Study 75-1, U.S. Civil Service Commission). Washington, D. C.: U. S. Government Printing Office, 1975.

Primoff, E. S. Self-assessment in examining. In E. Levine (Chair), Organizational applications of self-appraisal and self-assessment: Another look. Toronto: Symposium presented at the 86th Annual Convention of the American Psychological Association, 1978.

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