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## *The Analysis of Work in the 20th and 21st Centuries*

JUAN I. SANCHEZ  
and EDWARD L. LEVINE

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Although the flexibility demanded by the new economy is blurring the boundaries that used to define the responsibilities of a job, the analysis of work continues to be of invaluable help in designing and staffing organizations. It is therefore not surprising that early efforts to classify occupational requirements such as the US Department of Labor's *Dictionary of Occupational Titles* are being transformed into electronic systems such as the Occupational Network or O\*NET. New business trends demand new forms within each one of the traditional blocks of work analysis: type, source, data collection method, and level of information, as well as new thinking about the manner of storing, retrieving, and disseminating information. The evaluation of work-analytic data, however, should take a hard look at the extent to which such data fruitfully support the inferences and outputs that benefit other human resource functions such as selection and training, as well as the extent to which inferences and decisions prove capable of sustaining legal challenges. Choosing among the many methodologies available should be facilitated by this focus on the purpose of work analysis. Finally, the definition of work requirements should look beyond individual responsibilities and incorporate the organization's mission, values, and strategy without sacrificing sound measurement. The role of these and other macro variables in defining work requirements is of utmost importance when organizations have to compete in the global economy.

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### IS THE DEFINITION OF JOB ANALYSIS CHANGING?

Traditionally, job analysis has referred to the process of gathering, analyzing, and structuring information about a job's components, characteristics, including environmental contexts, and job requirements (Gael, 1988; Levine, 1983; McCormick, 1976). Recent changes in the dynamic nature of current work assignments have led some to announce 'the end of the job' as a fixed and stable set of predetermined responsibilities (Bridges, 1994). Although it is questionable that the notion of the job will go away, clearly job boundaries are blurring in many

work settings. In line with the evolving nature of work, Sanchez (1994) and Sanchez and Levine (1999) argued in favor of the term 'work analysis' in lieu of 'job analysis', to emphasize that the focus of the analysis of work should shift from the definition of rigid job boundaries to the facilitation of organizational effectiveness. Along the same lines, Visser, Altink and Algere (1997) have suggested employing the term 'work profiling' instead of job analysis. Although it might be still useful to think about 'jobs', the analysis of work should not necessarily use the 'job' as the primary or even the best unit of analysis. The term 'job' in 'job analysis' may soon be obsolete, just like the term 'Industrial' in the US designation of what in Europe is referred

to as 'Work' Psychology. The US nomenclature is reminiscent of a time when work psychologists were concerned primarily with manufacturing operations. In this chapter, we use the term 'job analysis' in its broad sense of work analysis.

Our focus in this chapter is mainly human resource (HR) applications of work analysis; however, readers should be aware of the fact that work analysis is also an important tool in non-HR applications, such as the ergonomic design of machinery and equipment. In fact, a work analysis pioneer like Ernest McCormick was also an early leader of the field of human factors or ergonomic design.

It has been argued that the derivation of human attributes or job specifications demanded by the job should not be included within the rubric of 'job analysis' (Harvey, 1991), despite the fact that early definitions of job analysis included data concerning skills, abilities, and personality traits (McCormick, 1976: 652–653). We definitely agree on the need to distinguish between the observable, behavioral aspect of job analysis, which merely describes job activities and the work environment, and the inferential function centered upon the derivation of human attributes required for job performance. However, we do consider the derivation of human attributes to be an integral component of job analysis. This 'translation' of job activities into human attributes is what makes job analysis a psychological endeavor, and one at which those without a psychological background often fail. Regardless of semantic distinctions in its definition, job analysis provides the basis for a host of organizational processes ranging from traditional human resource functions such as selection, training, job classification, performance appraisal, and compensation, to those concerning the latest trends like downsizing and workflow reengineering.

The following two scenarios, one from Europe and the other from the US, illustrate how strategic usages of job analysis can provide answers to the challenges posed by today's and tomorrow's dynamic organizational environment. Facing the task of creating a local police force in a territory where nationalist sentiments and anti-police attitudes were running high, the Basque Government decided that the Basque Police Force's responsibilities should match the security needs that residents of the Basque territory had previously expressed in a large-scale survey. Task analysis was used to monitor how well the newly created Basque Police was focusing on the Basque people's mandate. The analysis focused on the correspondence between the citizens' desired goals and the actual distribution of time spent on job tasks (Gorriti, 1996).

Now let us turn to the example from the US. The US Army is concerned about how changes in technology will affect the job requirements that should be demanded from soldiers in the twenty-first century. Night-vision goggles, body armor, hand-sized

portable computers, and other electronic devices are radically changing modern warfare. A future-oriented job analysis methodology is being considered as more and more tasks become automated or influenced by electronic devices, because it is probable that job requirements will change as well.

Work analysis, like any other scientific descriptive effort, has had, as one of its goals the development of a taxonomic system for clustering jobs, occupations, or components of these. In the next section, we focus on the classification schemes used to form clusters that themselves may serve useful human resource objectives.

## CLASSIFICATION OF OCCUPATIONS AND JOBS

In 1921, the International Labor Organization (hereafter referred to as ILO) detected the need to establish an international classification of occupations. The *Uniform International Classification of Occupations* was first produced by the ILO in 1958 (International Labor Organization, 1991), and it is updated every 10 years. The classification serves the purposes of facilitating cross-country statistics, occupational migration patterns, and helps in developing national classifications. Thus, countries have the need to develop 'cross-walk maps' that allow them to turn their national occupational codes into those used by the ILO's classification.

The *Dictionary of Occupational Titles* (DOT) (US Department of Labor, 1977) has been the national occupational classification system in the US, and it was produced by the Department of Labor. The original goal of the DOT was to improve job placement and counseling for unemployed individuals registering at offices of the employment service. The DOT classifies jobs using a nine-digit code. The first three digits specify the occupational code, the title of the job, and the industry; the next three digits indicate the extent to which the job incumbent has responsibility and judgment over data (e.g., coordinating), people (e.g., negotiating), and things (e.g., handling); and the last three digits are used to classify the job alphabetically within that occupational group with the same level of complexity.

### O\*NET

The Occupational Information Network or O\*NET is a new classification effort sponsored by the US Department of Labor. O\*NET is intended to replace the DOT by providing an automated database and a set of ready-to-use instruments for collecting, describing, storing, and disseminating reliable and valid occupational information (Peterson, Mumford,

Borman, Jeanneret & Fleishman, 1999). O\*NET is positioned to become an important tool for acquiring and exchanging occupational information in the twenty-first century. Perhaps the most novel aspect of O\*NET is its usage of 'multiple windows' or different kinds of descriptors ranging from fine-grained to broad and from generic to occupation-specific that could be used to address different issues. To facilitate the description of occupations across the economy, the developers of O\*NET chose cross-job descriptors that could be used to describe multiple jobs over job-specific descriptors like task statements. For instance, O\*NET uses 'generalized work activities', which are broader than traditional task statements so that the same descriptors can be used across jobs. However, occupation specific information is available in the database for use in accomplishing some objectives.

The O\*NET content model also distinguishes between worker requirements such as skills and knowledge, and worker characteristics such as abilities and values. O\*NET employs a modified version of Fleishman's Ability Requirement Scales (ARS) to identify job specifications. New categories such as occupational values and interests are also captured by ARS-like scales. Whether this 'holistic' approach to job specification ratings provides information that is as valid as that derived from simpler descriptors warrants further research.

### Other Taxonomies of Work

Several researchers have attempted the development of a taxonomy or classification of work. Such efforts have included both work activities and worker attributes, as well as the linkages between these two domains (i.e., what attributes are needed to perform which activities). For instance, Fleishman and his colleagues (Theologus & Fleishman, 1973) showed that abilities map onto performance dimensions. Second, the work of McCormick and his associates on the Position Analysis Questionnaire (McCormick, Jeanneret & Mecham, 1972) tied job elements to worker attribute profiles via factor analysis.

Still another noteworthy taxonomic effort is Holland's (1973). He postulated six major interest areas describing both work environments and types of people. According to Holland, the optimal vocational choice involves matching people with their proper environmental type. These six areas or themes are: realistic, investigative, artistic, social, enterprising, and conventional. Holland's taxonomy has been incorporated in vocational guidance instruments such as the Strong-Campbell Vocational Inventory, which are routinely used to match people and occupations. Meta-analytic research has generally been supportive of Holland's taxonomy (Tracey & Rounds, 1993).

## THE BUILDING BLOCKS OF JOB ANALYSIS

Job analysis can be said to involve four facets or 'building blocks' (Levine, 1983; McCormick, 1976): (1) the type of information to be collected, (2) the source of information to be employed, (3) the method of collecting information, and (4) the level of analysis or detail to be observed in the analysis. We add here a fifth, namely the manner of storing, retrieving, and disseminating data. The job analyst needs to decide among the various options or choices that exist within each one of these building blocks. In the next sections, we will review how traditional choices within these five building blocks should be reconsidered according to the changing rules of today's business environment.

### Types of Work-Analytic Information

Work-analytic data can be classified into two primary kinds: descriptions of the characteristics of the people doing the work and descriptions of the work itself. Often, several types of data are collected in the work analysis.

Almost all systematic job analysis methods collect data on the machines, tools, and work aids used. More complete analyses also include a record of contextual factors of the job (e.g., physical working conditions, environmental hazards, contact with co-workers). Some job analysis methods also provide information on work performance standards (e.g., quality and quantity standards, error analysis) and specific customer requirements, which can be helpful in documenting and supporting personnel decisions based on performance appraisal such as terminations, assignment to training, or promotion.

Descriptors of worker attributes that reflect the new strategic and team-oriented aspects of work are needed (Klimoski & Jones, 1995). Consider the case of customer service, which is a central element in today's service-oriented economy. Job descriptions have typically emphasized task performance or the technical component of customer service (Motowidlo & Van Scotter, 1994), but have ignored contextual aspects of performance such as organizational citizenship and service-oriented behavior (Organ, 1988). In general, work analysis has given insufficient attention to describing the dynamics of interpersonal behavior, which are not fully represented in task inventories incorporating only within-job activities or activities involving a single job title. Given an increasing reliance upon interdependent work processes in modern organizations, job analysis should emphasize the description of between-worker interfaces. Methodologies that describe dynamic processes, such as work process mapping can be a helpful supplement to traditional



job descriptions (Levine & Baker, 1991). Work process mapping relies on flowcharting to describe work processes. A work process map represents the flow of how work gets done to achieve specific goals (Galloway, 1994). A process map illustrates alternative paths thereby providing useful ideas for reengineering the tasks and decisions made in the process of transforming inputs into outputs. Processes are likely to become even more important as the basis of a work analysis as more organizations accomplish work through teams. Processes may usefully be explored in the team context because they include a clear terminal goal, multiple skills and competencies to complete a team task, and interdependence among value-added stages of the work.

The surging interest in personality factors called for by jobs and organizations is certainly congruent with current management trends such as employee empowerment, team-based organizations, and the prescription of emotional labor (e.g., employees of theme parks and even theme restaurants in the US are required to represent certain emotions). In his review of personnel selection methods, Salgado (1999) notes that the surging interest in personality led the French researchers Rolland and Mogenet (1994) to develop a job analysis system termed the 'Description in Five Dimensions' (D5D) based on the five-factor model of personality. Rolland has later expanded on this methodology by asking French soldiers who were part of the NATO's forces in the former Yugoslavian republics to describe their event-related emotions along the Big Five personality factors. In the US, Raymark, Schmit and Guion (1997) developed the Personality-Related Position Requirements Form (PPRF), which also attempts to identify Big-Five personality antecedents of job performance.

### **Sources of Job Analytic Information**

Although job incumbents have been the traditional Subject Matter Experts (SMEs) in job analysis, the frequency and intensity of interpersonal interaction demanded by today's changing assignments, which often require crossing functional boundaries, demand the inclusion of internal and external customers as sources of job analysis information (Bernardin, 1992). It is possible to select different sources of information regarding distinct aspects of the jobs, in a sort of a 360-degree approach to job analysis. That is, the recipients of each major job function should be first identified and then employed as sources of information on those particular functions. In the retail industry, for example, professional 'mystery shoppers' regularly visit branches armed with checklists of critical behaviors that employees should perform in their interactions with customers. Such professional shoppers are likely to provide a wealth of information concerning customer service.

Alternate sources of work information like mystery shoppers should supplement rather than replace job incumbents, who have direct and continuous information about the job, and are therefore best suited to inform others about them. However, incumbents cannot be presumed to be the best informants for every single piece of job-analytic information. For example, the difficulty of learning various KSAOs (knowledges, skills, abilities and other personal characteristics) may be best judged by training or education specialists, and psychological requirements like tolerance for stress may be best assessed by those holding a psychological background (Jones et al., in press). Sanchez, Zamora and Viswesvaran (1997) found that agreement between incumbents and non-incumbents was moderated by job complexity and job satisfaction, with agreement being highest when jobs were not complex and incumbents were not highly satisfied. Such findings reinforce the notion that job analytic judgments are affected by cognitive and affective factors and, therefore, a multi-source evaluation is more informative than a single source assessment.

An interesting issue that has been the object of recent research is the sampling of job analysis respondents. In other words, do relatively small panels of respondents provide job analytic information equivalent to that provided by large samples of respondents. Although the evidence suggests that panels may provide very similar information to larger samples (Tannenbaum & Wesley, 1993; Ash, Levine, Higbee & Sistrunk, 1982), we believe that this question is not fully answered by comparing the responses provided by the panel and the larger group. This kind of question can be addressed also by validating the job analytic information against a criterion of job success. That is, the convergence between panel and larger groups bears more on reliability of data than validity. It would be instructive to learn if the panel's data lead to outcomes as successful as those based on large samples of respondents.

The question also arises as to whether panel or team dynamics affect the quality of work analysis data. In the only study on this issue known to the authors, Levine and Sanchez (1998) studied group-level variables such as median age, group size, functional diversity, gender, racial and ethnic diversity. Across 14 diverse jobs (e.g., activity therapist, maintenance equipment operator and patient records technician) and several scales applied both to tasks on the one hand and knowledges, skills, abilities and other personal characteristics (KSAOs) on the other, the group variables appeared to have had little impact on various indicators of group member agreement or other indexes of data quality. This study was clearly exploratory, and more such research is indicated.

## Methods of Collecting Information

Traditional methods of data collection have included job observation, individual or group interviews, examination of diaries or records of critical incidents and work documents, and questionnaires. Although occupations cut across organizations and are therefore broader than job titles, relevant occupational descriptions listed in the *Dictionary of Occupational Titles* (DOT) can also be reviewed (US Department of Labor, 1977). According to Borman, Hanson and Hedge (1997), the person–job fit feature of O\*NET will allow assessments of person–job fit by comparing person attributes and occupational requirements.

In the US, there are legal reasons to document interviews, job observations, and other data collection activities very carefully, in order to facilitate an independent verification of what was done as mandated by the *Uniform Guidelines on Employee Selection Procedures* (1978). Applicants' rights to challenge selection or promotion decisions exist in every democratic society and, therefore, careful documentation of job analysis procedures is advisable where such challenges may be expected.

Traditional data collection methods assume that SMEs have prior experience on the job. However, when jobs are new or are changing, incumbents lack direct job experience. To guide this kind of future-oriented job analysis, Schneider and Konz (1989) suggest comparing present vs. future-oriented job analytic ratings as a means to ascertain trends in how the job will change over time. The validity of such SMEs' future-oriented ratings, however, should be evaluated in longitudinal designs rather than taken for granted.

Hypothetical scenarios can be designed to facilitate forecasts of future job requirements. Scenarios may involve the demographic and socio-technical factors affecting the job (London, 1988: 203). For instance, in the job of air traffic controller, tasks that used to be accomplished from the control tower are being shifted to computer screens operated in a 'dark room environment'. Simulations of such hypothetical scenarios are feasible and should be helpful in envisioning changes in job requirements. Subject matter experts charged with forecasting the requirements of tomorrow's air traffic controller may concentrate on currently computerized tasks, and then visualize themselves performing all tasks in a similar manner. Thinking about what will be different under the new paradigm may help SMEs formulate inferences about future-oriented work requirements.

In Sweden, Sandberg (2000) has advocated a phenomenological approach to the analysis of work, where work and worker are seen as one entity formed through the lived experience of work. This approach contrasts with the rationalistic view of the job as separate from the job incumbent that has

dominated the practice of work analysis in the US. Under the phenomenological prism, work analysts should strive to decipher the variations in the ways in which workers frame their work experience. Such an understanding facilitates the description of what constitutes job competence. In other words, work is described through conceptions of work, rather than 'verifiable' work attributes. Sandberg also argues for different kinds of validity and reliability criteria to evaluate a work analysts's interpretation of work competence. Specifically, he alludes to communicative and pragmatic validity, and to reliability as interpretative awareness. Although it seems unlikely that this kind of phenomenological validation will be well-received in countries with a positivistic tradition like the US, Sandberg's approach may serve to increase awareness about data-collection procedures such as in-depth interviews, which may shed light on the manner in which workers experience and conceive their work. Such insights may prove valuable in ascertaining the emotional and attitudinal requirements of work.

## Level of Analysis

Basic movements constitute the smallest unit of job analysis. The time-and-motion studies characteristic of the division of labor/scientific management approach focused on such movements. As most routine manufacturing and packaging operations become automated through computer-aided manufacturing, electronic commerce, digital phone menus and so forth, time-and-motion studies have lost ground. Still, the job analyst is often left with the decision of how broad the job descriptors should be. In the US, describing jobs at the task level has become common, probably because quasi-legal regulations such as the *Uniform Guidelines on Employee Selection Procedures* (1978) advocate the identification of important and critical work behaviors (in contrast, the Society for Industrial and Organizational Psychology's Principles do not explicitly call for important behavior identification in job analysis). Job tasks of the type employed in the task inventory approach, however, are too job-specific and do not allow cross-job comparisons. To circumvent this problem, McCormick (1976) suggested describing jobs using worker-oriented descriptors, which involve more generic yet behavioral descriptors than task statements. The advantage over the task inventory is that the same set of limited worker-oriented elements can be used to describe quite different jobs. The downside, of course, is that some job specificity is lost in the job description.

Job analysis has traditionally chosen to decompose jobs at the level of tasks and human attributes. However, the dynamic nature of today's jobs renders job descriptions obsolete very quickly in many business environments. Excessively detailed

or molecular job analyses are being replaced by descriptions that use broader descriptors of both work behaviors and human attributes. In line with this argument, the O\*NET project decided in favor of Generalized Worker Activities (GWAs) that parallel the broadly defined business processes characteristic of today's work assignments (Cunningham, 1996; Jeanneret, Borman, Kubisiak & Hanson, 1999). The question of whether these broad descriptors can provide sufficient information to inform human resource systems is an empirical one. The answer depends to some extent on the purpose of the job analysis, which will be discussed in a subsequent section.

### **Storing, Retrieving, and Disseminating Data**

It is striking that whereas all areas of work are rapidly changing due to technological advancements, the practice of traditional job analysis remains virtually untouched by modern technology. That is, face-to-face interviews and paper-and-pencil surveys are still the normal data-gathering procedures in most applications of traditional job analysis. Not surprisingly, today's cost-conscious organizations object to standard job analytic practices such as convening large panels of SMEs to provide task or KSAO ratings. Convening these panels is particularly impractical in today's highly distributed and decentralized organizations, where many organizational agents operate from remotely distant locales. For instance, the director of operations of a large telecommunications company in Brazil noted the difficulties inherent in arranging any kind of face-to-face meeting with his subordinates in the interior part of the country. A round-trip air ticket from the corporate headquarters in Sao Paulo to the interior part of the country is still twice as expensive as a round-trip ticket from Sao Paulo to Miami, USA., thereby rendering face-to-face meetings with corporate representatives in the interior land of Brazil very expensive.

It is noteworthy that traditional job analysis has not taken advantage of potentially rich sources of work information such as the data provided by electronic performance monitoring. For example, mobile maintenance units are equipped with telecommunication devices that allow headquarters to track their operations, such as number of stops, time spent on each service call, and so on. Similarly, transportation companies have on-board computers synchronized to the truck's engine, and are therefore capable of recording performance data such as speed and idle time. Call centers represent another industry where electronic performance monitoring keeps records of important work parameters such as the number of calls handled and the time spent on each call. Call center technology allows even live

monitoring of calls through the use of electronic switchboards.

It is paradoxical that, in traditional job analysis, many of these parameters of work that are nowadays electronically recorded by monitoring systems are instead estimated by SMEs. For example, task frequency and time spent are two task dimensions normally incorporated in task analysis surveys that may be more objectively ascertained by examining electronic records of performance over time. To illustrate how this may be done, an example from the US military may be instructive. As stated previously, the US Army is rapidly incorporating technology for the job of soldier in the twenty-first century. Night-vision goggles, body armor, hand-sized portable computers, and other electronic devices are radically changing modern warfare. A 'battle' map is periodically updated and maintained on-line by soldiers assigned to surveillance tasks; these soldiers use their portable computers to send relevant information such as changes in the coordinates of the enemy's position. The 'cookie files' or electronic records of these computers can be read to gather information such as the frequency and time spent on certain tasks. Electronic records are also left by e-commerce transactions between business to business (B2B) and business to consumer (B2C). Technical complexity and the potential for violations of individual privacy make the analysis of electronic records a challenge for work analysts.

Interviews and surveys may, however, remain an integral component of work analysis, because the data gathered electronically often lack the rich, qualitative dimension that is gained through more traditional formats such as one-on-one interviews. However, the expenses associated with face-to-face interviews and paper-and-pencil surveys can be significantly reduced by employing electronic media. Tele-conferencing and commercial 'groupware' supported by intranets are two examples of platforms that remain underutilized by traditional job analysts.

Internet capabilities allow access to a variety of data banks containing job and occupational data. For instance, O\*NET will contain data on at least 950 occupations in the US economy. Among the on-line capabilities planned for O\*NET, skill searches will be feasible, so that all the occupations that require a given level of a certain skill could be rapidly downloaded using O\*NET's online search engine. Requests for a specific job description are also common in e-mail lists of human resource specialists. As more organizations become willing to exchange this information for benchmarking purposes, a virtual database of 'just-in-time' job descriptions may become available on-line, thereby eliminating the need to 'reinvent the wheel' every time a job analysis is needed. Within organizations, human resource activities

such as recruitment can trigger an update of job specifications contained in a database. Before the recruitment campaign begins, for example, hiring supervisors may be sent the specifications in the files and asked to comment or to revise them as needed.

### **Criteria That Ought to Guide the Choice for Each Building Block of Job Analysis**

Several job analysis experts agree that these choices have to be guided by the purpose of the job analysis (Levine, 1983; Levine, Thomas & Sistrunk, 1988; Sanchez & Levine, 1999); that is, one needs to examine the intended application of the job analysis (e.g., the design of a selection procedure, a performance appraisal system, a training program, a job evaluation system), and make the choices within each building block that are best suited for such a purpose. Because job analysis can be time-consuming, job analysis experts have favored a multipurpose job analysis where multiple types of information are gathered so the job analysis can be used later on to support more than one application (Levine, Ash, Hall & Sistrunk, 1983). The O\*NET system is designed on that basis (Peterson et al., 1999). Thus, even though the organization may not intend to use the job analysis to support training design, enough information is collected so that, if a decision is made to do so in the future, the information would be available and the organization would not need to redo the job analysis.

In addition to the purpose of the job analysis, the type of job under analysis as well as the educational level and background of the job incumbents should be taken into account when deciding among the various options within each building block. For instance, choosing a questionnaire as the method of data collection may not be the best approach when analyzing a job that involves primarily a physical element, especially when incumbents are not used to filling out surveys and forms. Similarly, job observation may not be the best choice of methodology when analyzing the job of certified public accountant, because the tasks carried out by the incumbent are primarily directed toward internalized cognitive information processing, and are not readily observable. Other, more pragmatic issues may also be considered (Levine, 1983). Factors like cost and time to complete an analysis can be important in determining which of the options to employ.

As stated, a primary factor influencing work-analytic choices is the purpose of the work analysis. Such purposes are often embedded in the kinds of inferences that work analysis should support. Let us now turn to this issue.

### **INFERENCEAL LEAPS INFORMED BY JOB ANALYSIS**

As noted by Gatewood and Feild (1994), the main inferential leaps from job-analytic data to applications supported by job analysis are:

- Work-worker attribute leap. Work activity information (e.g., tasks, work behaviors, critical incidents) is used to derive human attributes or KSAOs.
- Worker attribute-intervention leap. Human attributes or KSAOs are used to select instruments (e.g., tests, interviews, assessment centers), devise training programs, enrich jobs, or develop other interventions that presumably build on those KSAOs.
- Work-performance measure leap. Work-related information such as tasks and critical incidents are used to design job-related performance measures.

Inferences vary along a continuum ranging from those immediately supported by job analysis such as KSAOs inferred from a task inventory to inferences distally supported by job analysis such as inferring the validity of a selection instrument by computing its correlation with a performance measure. This classification of job analytic inferences is consistent with the distinction between immediate and intermediate criteria drawn by Thorndike (1949). The ultimate criterion of job performance is often unavailable, and therefore researchers examine only immediate and intermediate consequences of job analytic data. For instance, studying whether difficulty-of-learning ratings for tasks affect the content of training programs relies on a less distal criterion than examining the indirect effect of these job analytic ratings on performance gains derived from the training program.

Consequence-oriented evaluations of work analysis are rare. For instance, Levine, Ash and Bennett (1980) showed that different job descriptions put together through different job-analytic methods led personnel specialists to develop very similar selection exams. This study uncovers an important issue in job analysis. That is, a very detailed or molecular job analysis may not always provide a significant return on investment. A particular job-analytic methodology may provide a wealth of information, but the rules governing the manner in which such job analytic information is used in making inferences may fail to capitalize on this abundance of data. In the next section, we review different rules that have been employed to make the inferences supported by job analysis.

## The Rules that Govern Job Analytic Inferences

We have just suggested that job analytic methodologies varying in the degree of detail may fail to produce significantly different outcomes. One such instance in addition to the example just discussed relating to human resource selection is in the area of job classification (Cornelius, Schmidt & Carron, 1984; Sackett, Cornelius & Carron, 1981). These findings do not mean that a detailed work analysis yields results that are necessarily equivalent to those of a cursory work analysis. The lack of significant differences between the outcomes generated by the two methodologies may be a function of the rather simple goals of the target inferences (e.g., create job groupings or families). When making more complex inferences such as those concerning the content of training programs, rules regarding the crafting of linkages between job analytic data and training content may pay off.

Consider the example of Goldstein's (1993) elaborate procedures for linking job analytic data and training programs. Such procedures if supported by properly designed research may produce more effective training programs. Other rules governing job analytic inferences involve setting cut-off scores on KSAO scales (Levine, 1983). These cut-off scores may be more effectively established via these rules than by leaving these choices to loosely defined 'professional judgment'. The decision charts employed by Fleishman and colleagues to help identify whether an ability underlies performance on a given task are another example of rules regarding job analytic inferences (Fleishman & Reilly, 1992). Still another example of an inference-making aide is the two-way matrix to facilitate the generation of linkages between job activities and KSAOs or between KSAOs and selection procedures (Arvey, Salas & Gialluca, 1992; Drauden & Peterson, 1974; Guion, 1980; Sanchez & Fraser, 1994). In short, inferential rules are as important as the quality and level of detail of job analytic data, because good data accompanied by inadequate rules may result in ineffective inferences.

When serving as expert witnesses in cases of selection procedures facing legal challenges, we have encountered instances where very molecular or detailed job analyses were not accompanied by rules through which to turn such data into job-related selection procedures. Levine, Sistrunk, McNutt and Gael (1991) have called for the development of standards concerning rules governing job analysis inferences. The absence of such a body of rules is of concern because the potential outcomes of time-consuming job analyses may fail to crystallize into such outcomes as better selection procedures. In addition, failing to demonstrate that molecular job analyses make a difference may raise skepticism about the need to invest in such labor-intensive procedures.

## LEGAL RELEVANCE OF JOB ANALYSIS

In the US, the enactment of the Civil Rights Act in 1964 and subsequent court rulings dealing with equal employment opportunity as defined in that law fueled an increased interest in job analysis. In particular, the [US] Supreme Court's seminal decisions in *Griggs v. Duke Power* and *Albemarle Paper Company v. Moody* emphasized the importance of demonstrating the 'job-relatedness' of employer selection systems. Despite accusations of being a 'legalistic nuisance', job analysis continues to play a pivotal role in many legal challenges of selection procedures. The legal mandate for a job analysis may not be as firm in other countries as it is in the US, but the need to justify the business necessity of human resource decisions cuts across national boundaries. In the US, such business necessity is closely associated with the job-relatedness of the selection procedure. Job-relatedness, in turn, can be demonstrated by content validity informed by a job analysis or by an empirical association between predictors and criteria of job success.

Quasi-legal standards enacted by National enforcement agencies such as the US Equal Employment Opportunity Commission (EEOC) also focus on the need for job analysis. The EEOC's *Uniform Guidelines on Employee Selection Procedures* (1978) demand that selection procedures be linked to important and critical job behaviors, which are identified through job analysis. Court cases like *EEOC v. Atlas Paper Co.* illustrate the risks of not conducting an on-site job analysis. There are a number of court cases which focus on the results of (or the nonexistence of) a job analysis. For example, women have challenged the physical ability tests (e.g., push-ups, sit-ups) mandated in past years for entry into some police or firefighters' academies.

In the US, when prima facie evidence of discrimination is established, the burden of proof then rests with the employer to show that the selection device or job specification (e.g., the test, test score, educational requirement) is 'job-related' or a 'business necessity'. In one case involving physical abilities, firefighter candidates in Dallas, Texas were required to climb a fence six feet in height in a prescribed amount of time. Because a higher percentage of women were unable to scale the fence than men, the court asked the city to show how climbing this fence was 'job-related'. The city presented job analysis data which demonstrated that the average fence in the jurisdiction was six feet in height and that scaling fences was a frequent activity which must be performed by competent firefighters.

In the US, legal challenges to job specifications involving physical attributes (e.g., strength, speed) and mental attributes have increased under the Americans with Disabilities Act (ADA). The ADA specifies that employers must make 'reasonable

accommodations' that would allow qualified disabled workers to perform the 'essential functions' of the job. The determination of such essential functions is clearly a job analytic activity (Brannick, Brannick & Levine, 1992; Mitchell, Alliger & Morfopoulos, 1997).

However, not all work analysis methods are equal to the task of providing legal defensibility; and legal defensibility, it seems, is largely a function of whether an impartial observer can place confidence in the inferences arising from a job analysis. More specifically, when work analysis data are (1) collected from a representative sample of job incumbents and other informed sources (e.g., supervisors and administrators), (2) represent the full breadth of tasks to be completed on a job, (3) are reduced to written form, (4) are current, and (5) specify the level of competency necessary for entry-level work, there is greater likelihood that the subsequent inferences about what KSAOs are needed to perform the job will stand up to legal challenges (Thompson & Thompson, 1985).

## JOB ANALYSIS OUTPUTS

Different job analysis methods yield different outputs or products; however, the most common outputs of job analysis are 'job descriptions' and 'job specifications'. Job descriptions define the primary job responsibilities or job functions. Job descriptions may also describe work aids, and equipment to be used on the job, working conditions, relationships with co-workers, and whether the job incumbent is responsible for people, cash, expensive equipment, and so forth. Job descriptions are often summarized in classified employment ads and Internet-based job placement services.

Job specifications consist of the human attributes or KSAOs needed to carry out the job tasks and duties. Educational requirements and minimum qualifications (e.g., Ph.D., MD, MBA, Ed.D., MSW, years and kinds of work experience), certifications or licenses (e.g., CPA, CFP), or other credentials are often listed in job specifications.

Job specifications may be contested because they may deny access to the job to individuals or groups who are protected by anti-discrimination laws. Thus, inferences regarding minimum qualifications should be backed by content or criterion-based evidence both of which rest on a foundation of job analysis (Levine, Maye, Ulm & Gordon, 1997). Unnecessarily inflated job specifications will result in higher labor costs and, at least in the US, are likely to be closely scrutinized by the courts. However, the courts have observed some flexibility in the need for an on-site job analysis in the case of police officers, where possessing a high level of education perhaps equivalent to a college

degree in the US is in the view of some an obvious requirement:

A police officer today is poorly equipped for his job if he does not understand the legal issues involved in his everyday work, the nature of the societal problems he constantly encounters, the psychology of people whose attitudes towards the law differ from his. Such understanding is not easy to acquire without the kind of broad general knowledge that a higher education imparts.

(*Davis v. City of Dallas*, 1990)

## JOB ANALYSIS METHODOLOGIES

There are many job analysis methodologies available today. The two-volume *Job Analysis Handbook for Business, Industry, and Government* (Gael, Cornelius, Levine & Salvendy, 1988) describes 18 different job analysis methodologies. *Everything You Always Wanted to Know About Job Analysis* (Levine, 1983) provides hands-on, practical descriptions of selected methodologies. In Europe, Fernández Ríos (1995) provides a comprehensive summary of the historical evolution of job analysis as well as descriptions of multiple job analytic methodologies. In fact, methodologies are not immune to the psychological theories that were dominant at the time of their development. For instance, the emphasis on tasks and work behaviors of the Functional Job Analysis, task inventory, and DOT approaches has a parallel in the behavioral analysis paradigm, whereas the Position Analysis Questionnaire's conceptualization of work in terms of inputs, mental processes, and outputs is indicative of cognitive and systems theories. Critical incidents also fall into the tradition of behaviorism, while the job elements approach may be linked to structuralism. Next, some of the most widely used methodologies will be summarized, but note that this list does not exhaust the large number of job analysis methodologies available.

### Functional Job Analysis (FJA)

Functional Job Analysis is a worker-oriented job analytic approach that was first formulated in 1951–52 and used as a basis for the third edition of the DOT in 1965 (Fine, 1988). Fine (1989) continues to expand the number of function scales in the FJA, which initially included only 26 functions.

The basic unit of FJA is the task. Fine noted that what passed for tasks in some job descriptions was often a miscellany of phrases referring not only to activities but also knowledge, skills, and abilities (1989). In an attempt to standardize the language of task descriptions, FJA uses the basic structure of the English sentence as a model. Thus, the basic structure of a task statement in FJA includes the

action verb, the object of the action, the source of information or instruction, and the results. These elements are combined in task statements of the DOT, where activities (action verb and object of the action) and outcomes (products and/or purposes) are matched (e.g., 'Operates grader following work order for haul road'). However, FJA task statements such as the ones found in DOT occupational descriptions are typically broader than those developed using other methods, and so they tend to be fewer in number. Indeed some may call these statements of major duties of a job or occupation.

The original assumptions of the FJA scales were that: Workers relate to a universe of objects represented by Data, People, and Things.

Workers relate to these objects through their physical, mental, and interpersonal potential. (Fine, 1989)

Skills can be represented as action verbs or functions, which can be in turn classified hierarchically within each object category (i.e., Data, People, Things). In this classification, each level includes those below it, and therefore identifying the three highest functions within each object category provides an accurate description of the job.

The People scale refers to interactions between people, communication, and interpersonal actions. Mentoring, for example, may be a job's most complex relationship involving people, whereas taking instructions is at the lowest end. The Data scale measures facts, ideas, mental operations, and knowledge of conditions. Synthesizing is at the highest end of this continuum, whereas comparing is at the lowest end. The Things scale assesses interaction with and response to tangibles and images visualized spatially. 'Setting up' is the action defined as the highest end of the Things continuum, whereas 'handling' is at the lowest end.

### The Task Inventory

The task inventory is a widespread job analysis approach that involves defining a list of tasks or activities carried out on the job. This methodology was pioneered by the work of Christal and his associates at the Air Force Human Resource Laboratory (Christal, 1974). The approach was initially designed for collecting and organizing task-level information for hundreds of occupations. The task inventory has become the job analytic methodology of choice of many organizations in the US, probably because of its high face validity and the mandate to reflect important and critical job behaviors in human resource systems. Task statements are usually worded using the elements of the basic English sentence as in Fine's FJA. However, the items that appear in many task inventories are better characterized as

work activities, since they often lack the structure required by FJA task statements.

Once the products are defined and the tasks and activities have been identified, they can be rated according to their importance, frequency, time spent, difficulty of learning, and so on. Research on the choice of scales for task analysis suggests that ratings of task importance, time spent, and difficulty of learning provide relatively independent information. When interested in identifying the most important tasks, relatively complex formulas that combine these ratings (e.g., criticality  $\times$  time spent + difficulty) do not appear worthy as the most important tasks can be simply identified by adding ratings of criticality (consequences of error) and ratings of difficulty of learning (Sanchez & Fraser, 1992; Sanchez & Levine, 1989). Harvey (1991) argued against the use of 'relative' scales (i.e., those that require within-job comparisons, such as asking how important a task is relative to all other tasks of the job), because such ipsative scales do not allow cross-job comparisons. However, Manson, Levine and Brannick (2000) found high levels of convergent validity and some discriminant validity among task constructs regardless of whether the scale was absolute or relative.

The term 'essential job functions' has been popularized by the language employed in the Americans with Disabilities Act passed by the US Congress. Thus, job analysis scales may be reworded so that respondents are asked to indicate whether a task meets several criteria as outlined by Brannick, Brannick and Levine (1994) to be labeled essential. As mentioned, the determination of the most important and critical tasks is also advocated by the *Uniform Guidelines on Employee Selection Procedures* (1978), and it has been supported by the US courts. The Society for Industrial and Organizational Psychology's *Principles*, in contrast, do not explicitly recommend the identification of important behaviors. Harvey (1991) argues that this is a shortcoming in the *Principles* because it opens the doors to unwarranted inferences about human attributes required for job performance.

Task inventories can be long and therefore the process of rating a large number of tasks on multiple scales can be tedious. How many tasks should a task inventory have? The answer depends on the kind of job under consideration, and on whether the inventory has been prepared to cover one or multiple jobs. A simple job may be described with a few dozen tasks, whereas more complex jobs may require hundreds of tasks. Of course, the number of tasks also depends on the level of detail observed in the task description. Because today's jobs change rapidly, it may be preferable to keep tasks at a relatively broad level of detail (Cunningham, 1996). Management philosophies like Total Quality Management and the trend towards a team-based organization also argue against establishing rigid



boundaries among jobs defined through detailed job descriptions. In addition, long inventories are tedious to complete and can lead to distorted responses due to fatigue. However, statements of tasks, or more exactly work activities, should not be so broad that they do not facilitate inferences regarding the requirements of a position. For instance, the statement 'handles citizen complaints' does not really indicate the degree of involvement of a police officer in this task; one is left wondering whether the incumbent simply records the complaint or tries to solve the complaint and, if so, how much autonomy the incumbent enjoys in finding an answer to the citizen's complaint.

Unfortunately, detailed job analyses have often been justified in the US by the need to safeguard against potential legal challenges, particularly in these litigious times. Job analysis, however, was not intended to be just a litigation tool. In fact, the primary purpose of job analysis continues to be aiding in the development of useful business applications like selection procedures, training programs, and performance evaluations.

### The Job Element Method

This job analytic methodology is characterized by an identification of the critical knowledges, skills, abilities, and other personal characteristics (or KSAOs) necessary to perform the tasks (Primoff, 1959). Knowledge refers to an organized body of information, usually of a factual or procedural nature applied directly to the performance of a function. For example, computer programmers may need knowledge of specific languages such as C++ or Visual Basic.

An ability refers to a demonstrated competence to perform an observable behavior or a behavior that results in an observable product. Firefighters, for example, are required to possess the physical ability to climb a ladder or the cognitive ability to understand and complete reports from the previous shift. A skill is a competence to perform a learned, psychomotor act, and may include a manual, verbal, or mental manipulation of data, people, or things. Examples are driving skill or skill in operating and maintaining a weapon.

Finally, other personal characteristics include personality factors, attitudes, and values needed to perform the job. Even something as simple as being courteous to civilians plays an important role in determining how well police officers perform their jobs. When firefighters do not tolerate stressful circumstances, or when police officers act impulsively thereby destroying evidence at a crime scene, they demonstrate some shortcoming on personal characteristics such as personality that affect their job performance. Being able to handle an irate customer and control one's temper may be critical in customer-contact jobs. The personal characteristics

and attitudes that qualify someone to work in teams are also examples of an 'other' attribute that is critical in many team-based organizations.

Each 'element' or KSAO is rated using four basic scales, which have been very influential in job analysis:

*Barely acceptable:* What relative proportion of even barely acceptable workers is good in the element?

*Superior:* How important is the element in picking out the superior worker?

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

*Practical:* To what extent can the organization fill its openings if the element is demanded?

Ratings are provided using three categories that can be scored as follows: + = 2, ✓ = 1, 0 = 0. The scale 'Superior,' which tries to identify the profile that distinguishes the superior from the average worker, illustrates the lasting influence of the job element method on such current human resource practices as competency modeling (Lucia & Lepsinger, 1999).

A&Os ('abilities' and 'other') are the basic foundations upon which K&Ss ('knowledge' and 'skills') are built. K&Ss are typically acquired through formal instruction and practice whereas A&Os are less easily acquired through experience and are also more stable over time. This point illustrates why screening on ability and other characteristics are so important for many jobs. Because A&Os (such as personality traits) are not easy to acquire through formal training, organizations need to be extremely careful in identifying job candidates who possess the requisite A&Os for subsequent job training success. Even professional standards like the Society for I/O Psychology's *Principles* (1987) warn against relying on easy to learn K&Ss when designing selection procedures, which should emphasize more difficult to learn A&Os.

An interesting component of the job elements method is its ability to provide an estimate of the validity of a test battery based on ratings of job elements and on prevalidated weights of the test elements. This validity estimate is expressed in mathematical form through the *J*-coefficient. The *J*-coefficient can be helpful in the many field situations that, due to small sample sizes and other practical constraints, preclude local criterion-related validation.

### Position Analysis Questionnaire (PAQ)

The Position Analysis Questionnaire (PAQ) is a standardized questionnaire which assesses activities using 187 items in six categories. These are (1) Information Input (where and how does the worker obtain the information needed to perform the job? e.g., use of visual or sensory input); (2) Mental Processes (what reasoning, planning, decision-making



or information processing activities are necessary to perform the activities?); (3) Work Output (what physical activities are performed, and what tools are used?); (4) Relationships with Other People (what relationships with other people are required to perform the job?; e.g., negotiating, performing supervisory activities); (5) Job Context (in what physical and social contexts is the work performed?; e.g., hazards, stress); and (6) Other Job Characteristics (what other activities or characteristics are relevant to the job; e.g., apparel required, work schedule, salary basis).

Items on the PAQ are rated using several different scales matched to the item including importance, amount of time required, extent of use, possibility of occurrence, applicability, and difficulty. The PAQ can be completed in about two and a half hours. The completed questionnaires are then shipped to PAQ services headquarters for computerized scoring. Each job is scored on 32 dimensions, and a profile is constructed for the job. Norms are provided so that the job profile can be compared to profiles of 'benchmark' jobs. Usually, a computer printout is prepared for each job which illustrates the job dimension scores and profile, estimates of aptitude test data (e.g., the average scores expected for incumbents on standardized tests), and job evaluation points for compensation purposes.

The PAQ must usually be completed by trained job analysts rather than incumbents since the language in the questionnaire is difficult and at a fairly high reading level. The instrument also lacks the specificity which can be gained by a task inventory developed within the company for one or more particular positions. In computing interrater agreement of PAQ ratings, researchers have warned about the spurious effects of does-not-apply items. That is, relatively high indices of agreement can be obtained simply because raters agree on which items do not apply, rather than on the value or rank-order of items' importance for the job (Cornelius, DeNisi & Blencoe, 1984; Friedman & Harvey, 1986; Smith & Hakel, 1979).

The extensive research that has been conducted with the PAQ makes it one of the most useful of the standardized job analysis instruments, particularly for selection and compensation purposes. PAQ results can help to set a wage for a new job or to reclassify jobs and to identify the most valid tests for selecting personnel for the job. In fact, the PAQ provides job component validity (Jeanneret, 1992), which represents a synthetic validity estimate that is highly similar to empirically-derived validity coefficients of cognitive ability tests (Hoffman & McPhail, 1998).

### Ability Requirements Scales

Fleishman and his colleagues (Fleishman & Reilly, 1992) developed the Ability Requirements Scales to

gain insights about common processes demanded by different types of tasks. Abilities were empirically determined through the relationships among abilities across these separate performance domains. In other words, factor-analytic studies or other clustering methods based on the correlations across diverse task performances help in identifying these separate ability dimensions. The development of this taxonomy of human abilities started with laboratory research in which tasks were specifically designed to test certain hypotheses about abilities in a certain range of tasks. Then, Fleishman and his colleagues proceeded to develop a rating scale methodology by means of which the ability requirements of tasks could be described. An interesting feature of these scales is the use of decision flow diagrams intended to simplify decisions by observers when estimating the ability requirements of a task. These diagrams represent an aid to facilitate binary decisions such as 'is the respondent required to choose between stimuli or responses?' or 'does the task require fine muscular adjustments?'

Evidence supporting Fleishman's Ability Requirements Scales includes controlled studies of performance in vigilance tasks, and predictive validity studies where judges' ability ratings were correlates of actual task performance (Theologus & Fleishman, 1973). The *Handbook of Human Abilities* (Fleishman & Reilly, 1992), which is often used with the Fleishman Job Analysis Survey (F-JAS), lists 21 cognitive abilities (e.g., originality, speed of closure), ten psychomotor abilities (e.g., arm-hand steadiness), nine physical abilities (e.g., trunk strength), and 12 sensory/perceptual abilities (e.g., depth perception). As stated, the F-JAS approach has been very influential in the development of O\*NET, whose scales parallel the content and format of the Ability Requirements Scales (Peterson et al., 1999).

### Critical Incident Technique (CIT)

This technique was originally developed during the Second World War as a training needs assessment and performance appraisal tool (Flanagan, 1954). In this regard, individuals recalled and reported specific behavioral examples of incidents that reflected exceptionally good or exceptionally poor performance (Bownas & Bernardin, 1988). However, not every description of a situation qualifies as a critical incident. Contrary to the kinds of descriptions that are sometimes claimed to fall in this category, a critical incident should possess four characteristics: it should be specific, focus on observable behaviors that have been exhibited on the job, describe the context in which the behavior occurred, and indicate the consequences, outcomes or products of the behavior. The following is an example of a well-written critical incident:

The parents arrive at the emergency room with their young son. The boy has a small scalp laceration requiring stitches. The parents demand that their son be seen immediately. However, there are more serious patients requiring immediate life-saving attention. The parents were informed of this, but this incited their anger. The nurse in charge listened to their concerns, assured them that their son would be seen as quickly as possible, and then checked back with them periodically. The parents found the nurse's explanations reassuring, and calmed down considerably.

Critical incidents are an excellent approach for the development of situational and behavioral interviews (Taylor & O'Driscoll, 1995), and also low-fidelity tests administered via paper-and-pencil or electronic platforms (Sanchez & Fraser, 1993). Experts can provide the examples or benchmark responses to the situation representing effective and ineffective performance, which are then used to develop the assessment instruments.

### **Job Components Inventory (JCI)**

In the UK, Banks (1988) developed the JCI as a tool for curriculum development and occupational and vocational assessment. Its primary goal is to provide information on job requirements to facilitate career development and planning. The JCI involves 132 items classified in six sections: tools and equipment, physical and perceptual requirements, mathematical knowledge, communication skills, decision-making and responsibility, and working conditions.

### **Task and Demands Analysis (Arbeitswissenschaftliches Erhebungsverfahren zur Tätigkeitsanalyse – AET)**

In Germany, Rohmert (1988) developed the AET methodology. Contrary to the methodologies developed in the US that often take the job's design for granted, the AET examines the degree of adjustment between the incumbent and the job. Its focus is on ergonomic stress or the extent to which job demands provoke the experience of stress on the incumbent. To evaluate stress, the AET examines the technological, technical, ergonomic, and organizational design where the incumbent works. In line with the philosophy of adapting work to the incumbent, this methodology takes into account the limitations of human physiology. The AET methodology involves a 216-item questionnaire that can be supplemented with additional sections focusing on specific requirements such as word processing and incumbent disabilities. The contrast between the focus of this European methodology and the ones developed in the US is noteworthy. That is, whereas American methodologies focus on maximizing performance by identifying an incumbent that best fits the job requirements,

the AET acknowledges that, in spite of individual differences, some work designs are likely to overwhelm even the most apt incumbent.

## **CHOOSING AMONG JOB ANALYSIS METHODOLOGIES**

A few studies have examined the relative effectiveness of specific job analysis methods. For example, one study asked experienced job analysts to indicate the extent to which four methods accomplished the various purposes for job analysis (Levine, Ash, Hall & Sistrunk, 1983). In addition, they were asked to evaluate the amount of training required for use of the method, the sample sizes required for deriving reliable results, and the cost to administer and score the job analysis method. The results indicated that, of the methods evaluated, if the purpose is to generate a job description or to do job classification or job design, one of the best job analysis methods is the Functional Job Analysis Method (FJA).

Their results also suggest that CIT is probably not as good for job classification purposes. The best methods for job evaluation as reported in that study are FJA and the PAQ. The PAQ is also an excellent method for the selection of the best test to use for hiring. If the purpose of the job analysis is to develop a performance appraisal instrument or to develop training programs, the recommended method is CIT. No method is ideal in terms of legal compliance, including compliance with the Americans with Disabilities Act or its precursors. For companies in need of highly detailed information about a job, the development of their own job analysis method is probably preferable to an 'off-the-shelf' type such as the PAQ which would not provide the level of detail in describing the job that may be needed to, for example, design a training program. However, as mentioned before, experts agree that the choice of job analysis method depends upon the purposes to be served by the data and the desired product. There is no 'one best way' to conduct a job analysis. The practicality and cost of the various methods for particular organizations must be considered as well (Levine et al., 1988). The most definitive finding from the research on the relative effectiveness of the various methods is that multiple methods of job analysis should be used whenever possible.

## **DOING WORK ANALYSIS IN A CHANGING ENVIRONMENT**

Due to changing technology and markets, job analyses may need to be conducted in situations where jobs do not already exist such as when a new business is started or where jobs are changing dramatically as might result from moving to an

electronic commerce environment. In instances where a job is being created or where it is undergoing significant change, job analysis becomes a predictive rather than descriptive tool. This approach has been termed 'strategic job analysis' as it intends to forecast what a job may be like in a new environment with new strategic goals, with different work aids (e.g., e-commerce), increased customer contact, or expanded duties (Schneider & Konz, 1989). In essence, strategic job analysis involves a comparison between present and future job descriptions to ascertain the extent to which job requirements may change. For instance, the Federal Aviation Administration has recently developed a job analysis methodology to identify changes in job requirements of the Air Traffic Controller job. As noted earlier, air traffic control tasks that used to be performed visually from the control tower are being shifted to a 'dark room environment' or computer room where traffic is controlled through electronic devices. The FAA was concerned about the extent to which these technological changes would modify the air traffic controller's job. Scenarios of future-oriented job performance can be simulated or recreated to gain insight into the job requirements needed for future job performance, so that selection procedures and training programs can be adapted to the new demands. This approach requires direct involvement from industry experts and organizational members, often from different functional areas. One of the risks of this approach is that it might degenerate into 'armchair job analysis' or mere speculation about what the future may bring.

In a way, future-oriented work analysis is not necessarily strategic. That is, when SMEs merely speculate about what the future may bring, they are not thinking strategically. Strategic work analysis should be proactive in the sense that, in addition to forecasting future work requirements, it should ensure the presence of the KSAOs needed to accomplish the strategic goals of the organization. The recent literature on strategic human resource management offers interesting insights into how organizations may engage in truly 'strategic' job analysis (Barney & Wright, 1998; Porter, 1985; Wright & McMahan, 1992). For instance, Schippmann (1999) describes how organizations wishing to achieve a competitive advantage by virtue of flexibility and speed may seek teamwork skills such as tolerance of ambiguity, whereas those whose competitive advantage is predicated on low cost may seek conscientiousness and dedication.

## COMPETENCY MODELING

The notion of 'competencies' and the practice of 'competency modeling' have acquired a great deal of popularity in recent years (Lucia & Lepsinger, 1999;

Schippmann, 1999). However, there is a wide range of variation in the definition of competencies. The term competency was made popular by Prahalad and Hamel's (1990) work on organizational core competencies, even though it was probably first enunciated by McClelland (1973) when he argued for the replacement of intelligence testing with competence testing. Some definitions hint that the line separating competency modeling from job analysis is a blurry one: 'an individual characteristic that can be reliably measured or counted and that can be shown to differentiate superior from average performers' (Spencer, McClelland & Spencer, 1994).

The need for competency modeling has been questioned (Barrett & Callahan, 1997; Pearlman, 1997). In closer examination, the main difference between job analysis and competency modeling may lie in the level of analysis, with competencies being broader human attributes than traditional knowledge, skills, and abilities (KSAs). However, the methodology employed in developing competency models seems at times a watered-down version of traditional job analysis methodology. Despite its less than rigorous methodology, we believe that the competency modeling trend should serve as a wake-up call to job analysis researchers and practitioners. Indeed, competency modeling includes an effort to understand the organization's mission, values, strategy, and broad goals and to incorporate those into the individual competency requirements. Such an effort is unfortunately missing in traditional job analysis formats.

One of the problems shared by a majority of approaches to competency modeling lies in the difficulty of measuring the focal constructs or competencies. That is, mapping these competencies in behavioral terms is not a straightforward task, primarily because the 'nomological net' of relationships with other variables (i.e., convergent and discriminant validities) is not always well understood. For instance, employees of a retail chain of office supplies expressed their concerns about being evaluated on competencies such as 'maturity,' whose behavioral referents seem fuzzy at best.

Unlike traditional worker attributes, competencies do not always have straightforward behavioral referents in prescribed job tasks (Jackson & Schuler, 1990; Kerr, 1982; Snow & Snell, 1993). In fact, competencies are often considered to be organizational rather than job bound. Thus, inferences about competencies cannot follow solely from the analysis of prescribed job activities. This need not be a drawback because sticking to a narrowly defined set of work activities may not be the ideal methodology to describe the attributes associated with today's ever-changing task assignments (Cannon-Bowers, Tannenbaum, Salas & Volpe, 1995; Stevens & Campion, 1994). For instance, competencies should also be informed by organizational variables such as strategic and core business

values. Making and justifying these inferential leaps on the slippery floor of behaviorally-fuzzy competencies is certainly a methodological challenge that deserves further attention. In advance of the empirical work that might support organization-wide and generic as opposed to job-specific and fine-grained sets of human requirements, Behling (1998) has provided a rationally derived set of guidelines which set forth conditions calling for one vs. the other.

### ANALYZING WORK IN THE GLOBAL ECONOMY

Globalization adds to the challenge faced by those who would analyze work. Although globalization affects the requirements of virtually every job, its influence is most obvious among international assignees. These expatriates should possess not only the technical requirements demanded by the job, but also the adaptability demanded by a new set of cultural rules. Four areas have been deemed equally important for expatriate work: technical skills, family situation, relational skills, and motivation. However, 90% of all companies appear to base their international selection solely on technical expertise. This widespread practice ignores that technically qualified candidates are not always capable of adjusting to critical cultural differences such as those involving social status and group dependence (Teagarden & Gordon, 1995).

When ascertaining the requirements of international assignments, cultural values and norms should be examined. In a way, culture analysis becomes an extension of work analysis when cultural boundaries are crossed. Theoretical frameworks distinguishing between cultural dimensions like uncertainty avoidance, individualism-collectivism, and power distance are available (e.g., Hofstede, 1984), and they provide a potentially useful list of cultural requirements demanded by expatriate assignments.

Openness to the profound personal transformation that awaits the expatriate executive is perhaps the most fundamental sign of expatriate readiness. It is not surprising that courage and risk-taking are among the core characteristics of successful expatriates who, knowing themselves, are willing to revisit their most deeply held assumptions. Authoritarianism, rigidity, and an ethnocentric attitude hinder a successful adaptation to a foreign culture. Because these are deeply ingrained personality traits that are not easily changeable, candidates should probably possess these characteristics from 'day one' on the job. Although traditional personality inventories have not proven very effective at predicting expatriate success, available measures specifically designed to evaluate expatriate potential appear promising (Spreitzer, McCall & Mahoney, 1997).

### EVALUATING WORK ANALYSIS DATA

Much of the success of work analysis efforts is a function of the extent to which the inferences one draws about job requirements lead to valid and useful selection procedures, training programs, and so on. One underlying objective of work analysis is to minimize the 'inferential leaps' required to arrive at conclusions regarding job requirements and specifications. Traditionally, it has been assumed that better inferences are made when the following work analysis practices are observed:

- 1 *Description of work behaviors.* In the US, quasi-legal standards such as the *Uniform Guidelines on Employee Selection Procedures* (1978) require that the KSAOs measured by the selection procedure be linked to important job behaviors. This link between important behaviors and KSAOs is also mandated by professional regulations concerning the practice of assessment centers (Task Force on Assessment Center Guidelines, 1989), although not, as we have stated, mandated by the Society for Industrial and Organizational Psychology's *Principles for the Validation and Use of Personnel Selection Procedures* (1987). Case law generated by US courts also suggests that an on-site job analysis that identifies the most important and critical job behaviors is necessary (*EEOC v. Atlas Paper Box Co.*, 1989; Williamson, Campion, Malos, Roehling & Campion, 1997). Sometimes the behavior necessary for successful performance is not directly observable, but the products or outcomes, kinds of materials or work aids used, and the people included in the decision process can be reported.
- 2 *Work analysis records.* The organization must maintain adequate records of the work analysis and document the linkages between the work analysis and human resource systems. The organization should be able to justify the inferences or judgments that work analysis supports. The data must be reliable, which is often measured by showing that different sources agreed on judgements about the work. Although agreement among SMEs formulating ratings of the same job is desirable, within-job title disagreement should be carefully explored. Disagreement is often interpreted as evidence that incumbents are biased in their reports or are actually performing different jobs. However, disagreement may also suggest differences in the manner in which the same job is performed among incumbents. Understanding such differences can provide meaningful information. For instance, Sanchez, Prager, Wilson and Viswesvaran (1998) identified a difference of

over \$50,000 in sales between two patterns of task ratings followed by SMEs holding the job of sales representative.

There has been considerable research on the extent to which job analytic data are vulnerable to bias (see Morgeson & Campion, 1997 for a review of potential sources of bias in job analysis). In the absence of a better criterion to evaluate job analytic data, disagreement among job incumbents of the same job title has, as we just suggested, been interpreted as a sign of bias. Instead of focusing on disagreement, it has been argued that evaluations of job analytic data should focus on the extent to which the data facilitate the formation of valid inferences regarding selection, training, and other decisions (Sanchez & Levine, 2000).

US courts have often been critical of the racial/sexual composition of work analytic panels of experts. The assumption behind this criticism is that, for example, a job specification stipulated by an all-white, male panel of job experts would somehow be biased against minorities and females. Although potential racial and gender bias should not be ignored, post hoc examinations of rating differences as a function of demographic factors such as race and gender are not likely to clarify the meaning of disagreement. That is, statistically significant differences are elusive and their practical significance questionable (Arvey, Davis, McGowen & Dipboye, 1982; Arvey, Passino & Lounsbury, 1977; Landy & Vasey, 1991; Schmitt & Cohen, 1989). Because disagreement may not always represent spurious variation, scrutinizing such differences may yield fruitful insights for human resource programs. We agree with Harvey's (1991) recommendation regarding the need to understand within-job disagreement. Specifically, a generalizability theory frame of mind is needed to reveal the sources of variance explaining within-job variance. As stated previously, Sanchez, Zamora and Viswesvaran (1997) found that incumbent–nonincumbent agreement was moderated by job complexity and job satisfaction, such that agreement was highest when jobs were simple and incumbents were relatively dissatisfied. Such findings show that understanding the origins of disagreement may be more informative than simply quantifying the level of disagreement.

## SUMMARY

Work analysis supports a variety of applications such as selection, training, performance appraisal, and compensation. However, as a result of technology, the flattening of organizational structures, and the dynamic global markets, jobs are no longer as static as they once were. The boundaries

distinguishing the responsibilities of one job from another continue to blur. It is not surprising that the analysis of work is shifting towards generalized work activities and broad dimensions that apply across a broad spectrum of jobs, while moving away from task-based descriptions that are very specific to a limited group of jobs.

Work analysis faces the challenge of producing enough information so that selection tests, levels of compensation, training and development efforts, and performance standards are demonstrably relevant to job success, and yet flexible enough to be applied to the study of dynamic work arrangements in continuous flux.

Despite rhetoric to the contrary, work analysis remains an essential tool in the repertoire of work psychologists. The 'de-jobbing' of organizations (Bridges, 1994) makes the analysis of work even more significant. Regardless of the plasticity of work assignments, studying current and possible arrangements of work process is *sine qua non* in the design of virtually every human resource system including downsizing, reengineering, recruitment, selection, training and career planning, performance appraisal, job redesign, compensation, and occupational health and safety. Even if the legal mandate for a work analysis did not exist in the US at least, the reliance upon work analysis is positive inasmuch as it improves the effectiveness of human resources practices. In this sense, the legal mandate for work analysis is fortunate, because it forces businesses to design human resource systems that are likely to improve organizational performance. In conclusion, although static 'jobs' may be a thing of the past, studying work processes and arrangements continues to be the foundation of any human resource system today and in the foreseeable future.

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