WORK ANALYSIS: FROM TECHNIQUE TO THEORY

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Work analysis is ubiquitous in organizational settings. As is often noted, work analysis serves as the foundation for virtually every human resource (HR) activity, including job description, classification, and evaluation; selection system development; job and team design; performance management programs; training program development; compensation program development; career management systems; workforce planning; and legal compliance (Brannick, Levine, & Morgeson, 2007). In short, work analysis is an essential HR tool. Given this plethora of uses, it is likely that work analysis data are the most widely collected type of HR data in both large and small organizations.

Traditionally, the analysis of work has been viewed as a process of collecting information about jobs (McCormick, 1979). As a consequence, research has tended to focus on a variety of technical and procedural issues, such as what, how, when, and from whom to collect data. More recently, however, scholars have begun exploring a range of theoretically driven issues associated with the collection of work-related information (Dierdorff & Rubin, 2007; Morgeson & Campion, 1997, 2000; Sanchez & Levine, 2000). One outcome of this expanded focus has been the suggestion that the term *job analysis* be replaced with the broader term *work analysis* (Sanchez, 1994; Sanchez & Levine, 1999, 2001). Given the recent focus on the broader world of work, coupled with our desire to move from a focus on job analysis techniques to a focus on work analysis theory, we use the term *work analysis* throughout this chapter. This encompasses traditional job analysis topics as well as more recent innovations in work analysis.

We seek to achieve two primary goals in this chapter. First, we offer some historical background and review of past work analysis research. This provides a sense of what research has been conducted in this area. However, we want to move beyond a simple summarization of past research. Thus, our second goal is to draw from the considerable body of work analysis research to discuss recent innovations and map out a strategy for moving work analysis research forward. Quite frankly, we want to shake things up a bit and try to stimulate some new thinking in the work analysis domain. We feel not only that work analysis is foundational to any understanding of individual and organizational performance, but also that there are still many important and interesting research questions to be answered. Thus, our goal in this chapter is to be a little provocative and approach work analysis in a slightly different way than it has been approached in the past, all in the hopes of moving this area of research forward.

To do this, we first provide an extended definition of work analysis. Our goal is to define work analysis in such a way as to not only incorporate past conceptualizations but also create a more flexible and inclusive definition that helps us advance future research. Second, we briefly review the history of

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work analysis. Such a review enables us to understand the evolution of work analysis by identifying where we have been and what is still left to be done. Third, we discuss the range of practical choices that need to be made when analyzing work. A number of considerations go into making these choices, and we discuss the pros and cons of these choices. Fourth, we then discuss the Occupational Information Network (O*NET), which is the biggest innovation in work analysis in recent years. Fifth, we discuss a recent stream of research that has sought to explore how different factors can influence the quality of work analysis information. Sixth, we then highlight a range of potential future research directions for work analysis. Finally, we conclude with a discussion of how we can take a more theoretical view of work analysis as research proceeds into the 21st century. (See also Vol. 1, chap. 13, this handbook.)

DEFINING WORK ANALYSIS

Work analysis can be defined as the systematic investigation of (a) work role requirements and (b) the broader context within which work roles are enacted. Because this definition differs somewhat from past definitions, further explanation is warranted. We use the term *work role requirement* as a short-hand way of describing both work and worker requirements. Work requirements would include such things as the tasks performed and the general responsibilities (or work activities) of those performing the work. Worker requirements would include the different types of knowledge, skill, ability, and other characteristics that are needed to perform the work (see also Dierdorff & Morgeson, 2007). Such a distinction between work and worker requirements is consistent with the "two worlds of human behavioral taxonomies" identified by Dunnette (1976) and the "activity" and "attribute" distinction more recently articulated by Sackett and Laczo (2003).

In addition, we have deliberately chosen to focus on roles rather than the traditional focus on jobs for five reasons. First, as an expected pattern or set of behaviors interrelated with the behaviors of others (Biddle, 1979; Katz & Kahn, 1978; Stewart, Fulmer, & Barrick, 2005), a role subsumes the traditional work requirements of both tasks and responsibilities and thus helps integrate across work requirements. This offers a more flexible language with which to describe and discuss work. Second, a focus on roles enables the explicit acknowledgment of connections to and among other role holders, as well as the embeddedness of roles in the broader work context. Although often touched on in traditional definitions, this has tended to be neglected in practice. Third, one of the traditional criticisms of work analysis is that it tends to view jobs as static entities (Guion, 1993). By focusing on roles, we move away from a more static conceptualization of jobs to a more flexible roles orientation. Thus, work analysis could consider not only prescribed or established task elements, but also discretionary or emergent task elements (Ilgen & Hollenbeck, 1991; Morgeson & Humphrey, 2008). Fourth, focusing on jobs tends to place an emphasis on work activities, leading some to conceptualize work analysis in a narrow fashion (Harvey, 1991). However, it is clear that work analysis includes the study of both work activities and worker attributes (Sackett & Laczo, 2003; Sanchez & Levine, 2001). Considering roles and role enactment leads more naturally to a consideration of worker attributes.

Fifth, focusing on jobs places an emphasis on individual job incumbents. Although this is often justified given the uses of work analysis data, it tends to ignore the fact that jobs are situated in a larger team and organizational context. One problem with focusing primarily on individual jobs is that there is an insufficient link to an organization's business goals and strategies (Schippmann et al., 2000), prompting many to pursue a quasi-work analytic approach like competency modeling. The role concept, in contrast, is implicitly multilevel. For example, a role can be described in terms of individual role holder work activities, the combination of roles that exist within a team that produces interdependent collective action, and the structure of organizations as a system of roles (Katz & Kahn, 1978). Thus, in conducting a work analysis, a focus on roles could alert the analyst to consider how individual roles connect to the broader system of roles within the organization and the implications of these connections for the specific role under consideration.

HISTORY OF WORK ANALYSIS

Collecting work-related information has long been important to large-scale human endeavors. For example, Mitchell, Bennett, and Strickland (1999) pointed out that the first effort to document information about work could be seen over 3,000 years ago in the Imperial Court of China (circa 1115 B.C.). During the more recent times of the past century, Münsterberg (1913) pioneered systematic methods for estimating job requirements for personnel selection purposes and job design. The first history of work analysis was compiled by Uhrbrock (1922), in which he emphasized using job analysis for setting performance standards and introduced the need to identify personal attributes associated with successful job performance (Wilson, 2006). Perhaps in a bit of historical irony, Frederick Taylor actually used the term *work analysis* in the early 1900s (Cunningham, 2000), despite our modern day depiction of scientific management as having an exclusive emphasis on reductionism to the most molecular of behavioral elements!

Even with these rich historical linkages, what we have come to currently recognize as the field of work analysis has its firmest roots in research conducted after the 1940s. Because there have been several excellent reviews of this period (e.g., Mitchell, 1988; Mitchell & Driskill, 1996; Primoff & Fine, 1988), we do not discuss these historical developments in detail. Instead, we focus on trends in work analysis research over the last 50 years. Although published work analysis research certainly predates 1960, we felt that a nearly half-century snapshot would be sufficient for depicting any important trends. We searched PsycINFO for work analysis research published since 1960 using keywords such as *job analysis, work analysis, job specification,* and so forth. We restricted our search to only research published in peer-reviewed journals, thus excluding dissertations, technical reports, and books. Finally, an article's primary focus had to be work analysis to be included. Thus, articles that simply presented the results of work analysis (e.g., job description of a nursing occupation) and tangentially related articles not specifically focused on work analysis (e.g., job redesign, synthetic validity) were excluded.

Figure 1.1 displays the frequency of work analysis publications across the 48-year time period. In total, the search produced 193 work analysis journal articles that have been published in peer-reviewed journals. When examined by each decade, close to one third (30%) of the articles were published during the 1980s alone. Approximately 7% of the publications were during the 1960s, and 17% were during the 1970s. The publication percentages for articles in the 1990s and 2000–2008 were nearly equivalent

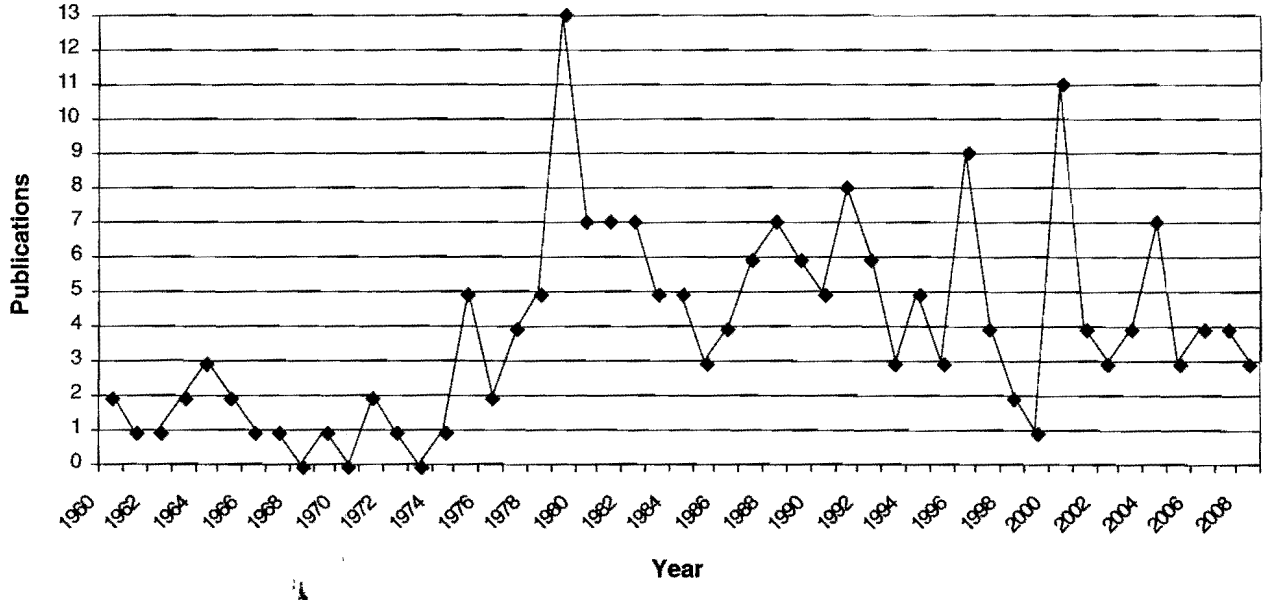

FIGURE 1.1. Frequency of work analysis publications from 1960–2008.

(about 23%). Thus, with respect to pure volume, it appears that almost as many work analysis articles have been published before and after 1990 (54% compared with 46%). The pattern of publications after this date also appears to display greater variability, as represented by the larger peaks and valleys in the figure. Additionally, around this time, it was widely discussed among work analysis scholars that work analysis research was not garnering much respect (i.e., being published) in industrial–organizational (I/O) and management journals (Cunningham, 1989). However, a more nuanced examination of previous work analysis articles reveals trends that may shed light on this historical concern.

The data in Figure 1.1 clearly show that work analysis research is alive and well and is being published in peer-reviewed journals, albeit with slightly more variability in volume in recent years. Note, however, that this conclusion is in an absolute sense (i.e., exclusively focusing on work analysis research). Cascio and Aguinis (2008) recently found in their content analysis of *Journal of Applied Psychology* and *Personnel Psychology* that research within the work analysis domain has waned relative to other research domains within I/O psychology. With this in mind, we examined what journals have published work analysis articles and how the publishing outlets may have changed over time. To accomplish this, we categorized the collected work analysis articles into two broad groupings: (a) those published in one of the "top seven" journals (as identified by Podsakoff, MacKenzie, Bachrach, & Podsakoff, 2005) and (b) those published in any other journal. The results of this analysis are displayed in Figure 1.2.[1] These findings show a striking trend toward proportionally fewer work analysis articles being published in the top seven journals across the 48-year time period. For example, from 1960 to 1979, approximately 77% of all work analysis articles were published in one of the top seven journals. Although this proportion decreased to 58% during the 1980s, the overall number of work analysis articles in top seven journals still increased from the previous decade. The most noticeable decrease began in the 1990s, where only about 28% of work analysis articles were published in top seven journals, and this downward trend continues today (e.g., 27% since 2000). Collectively, these results suggest that work analysis research is increasingly absent from the most influential journals.

Such a decrease is unfortunate, in part because of the influence the top journals have on shaping the field. For example, one might wonder whether the substantial volume of research concerning the Position Analysis Questionnaire (PAQ; McCormick, Jeanneret, & Mecham, 1972) would have been conducted (and subsequently published) if the original research had not appeared in a monograph within *Journal of Applied Psychology*, one of the top applied psychology journals. Or, as another example, whether there would have been such widespread acceptance and ensuing use of the critical-incident technique had it not been published in *Psychological Bulletin* (Flanagan, 1954), a top psychology journal.

To get a better sense of publication trends over time, we qualitatively reviewed the work analysis articles to see if we could further discern any patterns in the type of research being published over the last 50 years. This examination produced 10 broad categories shown in Table 1.1. This table also provides the percentages of articles falling into each category. These data show that, with the exception of research examining rater training and rating scales, work analysis research has a relatively even distribution across the topical groupings (ranging from 8% to 15%). However, percentage differences for some categories were apparent with respect to the nearly 5 decades that the research spans. For example, all of the research focusing on specific work analysis instruments was published prior to 1990, as well as the majority of research (75%) regarding various analytic techniques (e.g., factor analysis). The majority of

[1] Podsakoff et al. (2005) divided management-related journals, which includes top I/O psychology journals, into quartiles on the basis of the journal's impact (as assessed by citations per article). The top quartile consisted of the *Academy of Management Journal*, *Academy of Management Review*, *Administrative Science Quarterly*, *Journal of Applied Psychology*, *Organizational Behavior and Human Decision Processes*, *Personnel Psychology*, and *Strategic Management Journal*. These "top seven" journals accounted for almost 61% of all citations between 1981 and 1999. Moreover, the top seven journals "averaged almost six times more citations per paper (23.93 vs. 4.54) from 1981 to 1999 than the seven bottom journals" (Podsakoff et al., 2005, p. 481). Although some of these journals do not necessarily publish work analysis articles, many of them do. These journals are, however, highly influential and thus represent a good way to examine the prominence of work analysis research in the field of psychology.

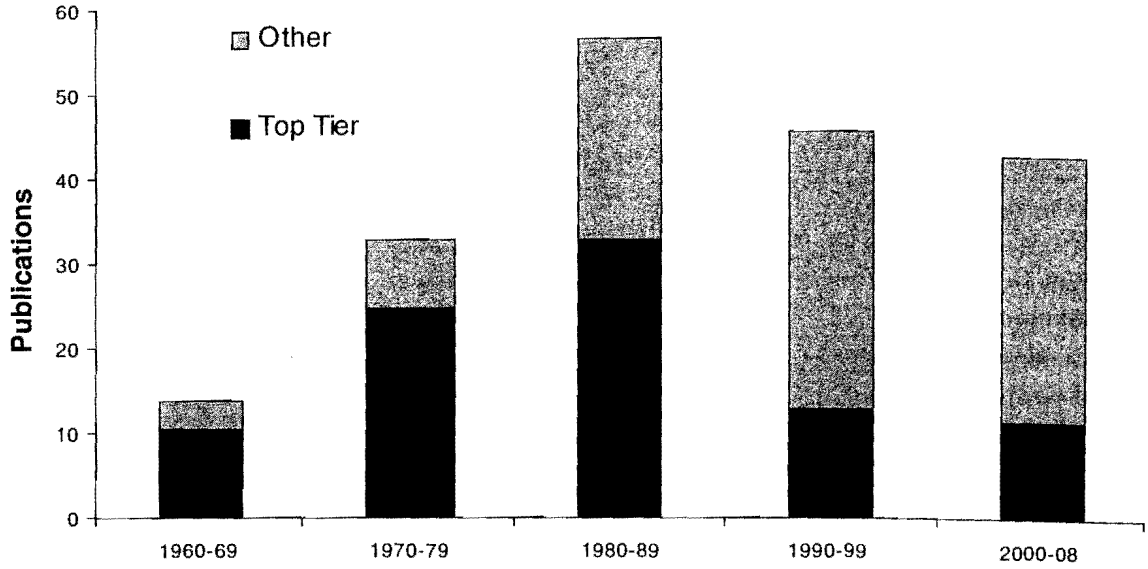

FIGURE 1.2. Work analysis publications in the top seven journals (top tier) and all other journals.

research on job classification and clustering occurred during the 1970s and 1980s (70%). In comparison, articles published on three of the topics (development of instruments, procedures, or taxonomies; uses for work analysis information or results; and general or topical reviews) were rather evenly spread throughout the 5 decades. Finally, research in the area of reliability and validity and in the area of factors influencing ratings was primarily conducted since 1990 (74% and 57%, respectively).

This qualitative investigation yields two key insights. First, there are notable omissions in past work analysis research. For example, Sackett and Laczo (2003) previously described several important changes in work analysis practice that had taken place by the time of their review of the field. These changes included personality-oriented work analysis, competency modeling, cognitive task analysis, strategic job analysis, and issues of accuracy in work analysis. However, published research on most of these changes remains largely absent. That is, the empirical work analysis literature offers little evidence regarding a host of questions surrounding the ramifications of these changes (e.g., issues of utility, reliability, validity, legality, acceptance).

TABLE 1.1

Work Analysis Topics Studied

Category	Percent
Development of instruments, procedures, or taxonomies	13.47
Reliability and validity	13.99
Instrument-specific research	10.36
Uses for job analysis information–results	13.47
General or topical review	12.95
Job classification and clustering	8.81
Rater training	2.59
Factors influencing ratings	14.51
Rating scales	1.04
Other analytic techniques	8.29

Furthermore, Sackett and Laczo (2003) noted this same empirical paucity over 5 years ago. For example, from our literature search, since 2003, only a single published article examined the use of strategic job analysis (e.g., Siddique, 2004), and this was merely an indirect examination. The same situation was found for personality-oriented work analysis as well (e.g., Cucina, Vasilopoulos, & Sehgal, 2005). Two exceptions to this scarcity trend are in the areas of competency modeling and issues of accuracy. Since 2003, at least four articles have included examinations related to competency modeling (e.g., Goffin & Woycheshin, 2006; Lievens & Sanchez, 2007; Lievens, Sanchez, & De Corte, 2004; Morgeson, Delaney-Klinger, Mayfield, Ferrara, &

Campion, 2004) and five articles have focused on factors related to accuracy (e.g., Dierdorff & Rubin, 2007; Dierdorff & Wilson, 2003; K. Prien, Prien, & Wooten, 2003; Van Iddekinge, Putka, Raymark, & Eidson, 2005; Wang, 2003). Thus, it appears that work analysis research needs to begin to focus research attention on some of the techniques and changes that have occurred in work analysis practice.

A second implication of our analysis is that the topical focus of work analysis research has not changed all that much over the past 50 years. This is especially true for work analysis research concerned with more technical questions, such as developing new procedures or taxonomies, using work analysis data for different purposes (e.g., content-related validity for test creation), and so forth. Thus, it appears that considerable work analysis research continues to focus on technical issues rather than theoretical issues. Perhaps this can explain the relative decrease in work analysis research in the top journals. As the field of I/O psychology has matured, empirical research is expected to make stronger theoretical contributions. To the extent that work analysis research is unable to contribute theoretically, it will likely be shut out from the top journals in the field.

However, there does appear to be some hope, as there has been a recent increase in the amount of work analysis research going beyond these traditional areas. One common thread among this research is the focus on a theory-driven understanding of the various nonjob factors that influence work analysis judgments. For example, this research has been conceptually driven using cognitive (schema) theory (e.g., Lievens & Sanchez, 2007), role theory (e.g., Dierdorff & Morgeson, 2007; Dierdorff & Rubin, 2007), and impression management (self-presentation) theory (e.g., Morgeson et al., 2004). Important to work analysis research, this recent trend may indicate that a reinvigoration of the topics examined in work analysis, as well as a grounding of such research in relevant psychological theory, is both fruitful and necessary. We return to these points in greater detail within ensuing sections of this chapter.

WORK ANALYSIS CHOICES

Conducting a work analysis involves making numerous choices. These choices reflect the different ways a work analysis can be conducted in practice. We first discuss the range of choices that can be made, including the choice of descriptor, the methods to use, the rating scales to use (if using the questionnaire method), and the sources of work analysis data. Because these choices are driven by the purpose of the work analysis, we then discuss the intersection of the purposes and work analysis choices.

Descriptor Type

Broadly speaking, descriptors are simply the various features of work examined during a work analysis (Brannick et al., 2007). There are three major types of descriptors that can be used in work analysis. The first concerns the requirements of the work itself and involves the activities performed by workers (Sackett & Laczo, 2003). The two most commonly discussed work requirements are the specific tasks performed and more general work responsibilities. Tasks are collections of specific work elements and include actions, the object of the action, and the purpose or results of the action (Fine & Getkate, 1995) as individuals fulfill their work roles. Of importance, tasks are typically specific to a particular work role. For example, the tasks for an industrial machinery mechanic would include such things as disassembling machinery and equipment to remove parts and make repairs and repairing and replacing broken or malfunctioning components of machinery and equipment.

Responsibilities are collections of related tasks that represent a set of generic behaviors applicable across a wide variety of work roles (Cunningham, 1996). As such, responsibilities are broad activity or behavior statements that are aggregates of several highly related behaviors used in accomplishing major work goals (Jeanneret, Borman, Kubisiak, & Hanson, 1999). Continuing our example, responsibilities for an industrial machinery mechanic would include repairing and maintaining equipment and inspecting equipment, structures, or material.

The second major type of descriptor concerns worker requirements and involves a consideration of

the worker characteristics needed to successfully perform the work (Sackett & Laczo, 2003). Four commonly discussed worker requirements include knowledge, skill, ability, and other characteristics. Knowledge can be defined as collections of discrete but related facts and information about a given domain, such as biology, mathematics, or medicine (Costanza, Fleishman, & Marshall-Mies, 1999). A further distinction is often made between declarative (knowledge of what) and procedural (knowledge of how) knowledge (Campbell, McCloy, Oppler, & Sager, 1993).

Skills reflect the level of proficiency or competency to perform a task or learned activity (Peterson et al., 2001). Skills can be divided into basic and cross-functional categories. Basic skills are thought to facilitate learning or knowledge acquisition and include such things as writing or critical thinking skills. For their part, cross-functional skills are developed capabilities that foster performance across job contexts and include such things as problem solving and negotiation skills. Skills are commonly thought to improve with training and experience on a particular task.

Abilities are relatively enduring basic capacities for performing a range of different activities (Fleishman, Costanza, & Marshall-Mies, 1999). This would include cognitive (e.g., verbal, quantitative), psychomotor (e.g., reaction time, manual dexterity), physical (e.g., strength, endurance), and sensory–perceptual (e.g., visual, auditory) abilities. Relative to knowledge and skill, abilities are thought to be more stable over time.

Other characteristics is a catch-all category designed to encompass all other potentially relevant factors that might be important for successful performance. Other characteristics that are commonly discussed include personality and motivational traits (e.g., conscientiousness, leadership, initiative), specific forms of work and educational experience, and licensure and certification that may be required in certain fields (e.g., registered nurses, certified public accountant).

The third major type of descriptor concerns the work context within which work is performed (and roles are enacted). Work context can be broadly defined as "situational opportunities and constraints that affect the occurrence and meaning of organizational behavior as well as functional relationships between variables" (Johns, 2006, p. 386) and consists of task, social, and physical aspects (Hattrup & Jackson, 1996; Johns, 2006; Strong, Jeanneret, McPhail, Blakley, & D'Egidio, 1999). The task context reflects the structural and informational conditions under which work roles are enacted and includes such things as the amount of autonomy and task clarity, the consequence of error inherent in the work, level of accountability, and the resources available to perform the task. The social context reflects the nature of role relationships and interpersonal contingencies that exist among workers and includes such things as social density, different forms of communication, the extent and type of interdependence with others, and the degree of interpersonal conflict present in the work environment. The physical context reflects elements of the material space or built environment within which work roles are enacted and includes general environmental conditions (e.g., noise, lighting, temperature, air quality), presence of hazardous work conditions (e.g., radiation, high places, disease exposure), and overall physiological job demands (e.g., sitting, standing, walking, climbing). Although the nature of the context is not often explicitly taken into account when conducting work analysis, recent research has shown it can have a pronounced effect on work role requirements (Dierdorff & Morgeson, 2007).

Method

Once a decision is made on the type of descriptor(s), the next choice involves the method to use to collect data on those descriptors. There are many different methods to use (see Ash, 1988; Brannick et al., 2007, for comprehensive lists), but some of the most common include observation, individual interviews, group meetings, and questionnaires. Note that there is very little research that compares the relative effectiveness of these different work analysis methods (see Ash & Levine, 1980, for a framework for evaluating work analysis methods). A general rule of thumb, however, would be to use multiple methods that could permit subsequent triangulation of collected

information, as well as the opportunity to capture different perspectives of the target work roles under examination. Of course, time requirements, cost effectiveness, and, most importantly, the intended purpose of the information (discussed later in this section) must be considered when choosing work analysis methods.

Observation can take several forms, but the most often used method involves direct observation, whereby someone not directly involved in the task performance (e.g., a supervisor, job analyst) observes workers as they complete their tasks. Generally, an observer would record (via notes, checklists, or questionnaires) the what, why, and how of various aspects of the work. Other forms of observation include having supervisors record or recall particularly effective or ineffective worker behaviors (i.e., critical incidents) or video recording worker task performance for later analysis. Although time consuming, an advantage of observation is that it is not subject to problems of selective recall or other reporting biases on the part of workers (but there is potential bias in terms of what is recalled). However, for some jobs it may not be possible to observe key aspects of the job, particularly for work that has a large mental or knowledge component (i.e., most work processes occurs in the head of the worker).

Individual interviews involve conducting interviews with respondents one at a time. Typically, interviews are conducted with multiple different types of respondents (e.g., workers, supervisors) who are asked similar types of questions about the work. Interviews enable the acquisition of detailed information, in part because the interviewer can prompt the interviewee for additional details and check or otherwise question the validity of the information being transmitted. A major challenge of interviews is that some individuals might not be able to describe what they do or what the work requires in sufficient detail. This is particularly likely to occur if an individual has been working in the role for an extended period of time and has routinized the performance of major tasks. Another potential limitation is interviewer bias in terms of faulty recording or recall of the content of the interview itself.

Group meetings (also called "subject matter expert" [SME] meetings) involve getting a number of workers, supervisors, or technical experts together to discuss various aspects of the work. Typically, one would conduct separate meetings for workers, supervisors, and technical experts, in part because one would likely focus on different aspects of the work with the different groups. Such meetings are usually facilitated by a job analyst and are a more efficient way to collect information than the individual interview. Common activities in group meetings include brainstorming or generating lists of activities or attributes or evaluating data that have been previously gathered. An advantage of group meetings is the possibility of consensus, which is often needed for implementation of a work analysis product. However, group meetings can be subject to numerous dysfunctional group processes, including a lack of participation by some group members and conformity to a dominant group member. Such social processes are discussed in greater detail later.

Questionnaires are structured surveys (either paper and pencil or computer based) used to collect information on any of the work role requirements discussed previously. There has been a tremendous amount of research on the questionnaire method (somewhat in contrast to the other methods). The bulk of this research has focused on the presentation and evaluation of particular work analysis methods or questionnaires (although recognize that the use of custom, organization-specific work analysis questionnaires is widespread). Some examples of the questionnaire approach include the task inventory approach (e.g., Gael, 1983), the PAQ (McCormick et al., 1972), and the O*NET (Peterson et al., 2001). The evaluation of each of these questionnaire methodologies is beyond the scope of this chapter, but one advantage of this method is its ability to systematically gather a large amount of work-related information that can be quantitatively summarized. These strengths, however, should be balanced against some potential weaknesses. Questionnaire respondents can be overwhelmed by the task (some questionnaires can be several hundred questions long and involve numerous rating scales) and subsequently provide responses that are unreliable and inaccurate.

Type of Rating Scale

As noted, the questionnaire method has received a great deal of attention. One of the key decisions to be made when using the questionnaire methodology is which kind of rating scale to use. In this section, we discuss some of the rating scales that have been used in the past. Although many of these scales have been used to collect task-related information, they can also be used to collect other work and worker requirement data. Table 1.2 provides examples of some of the most commonly used scales.

It is often helpful to obtain estimates about how often particular tasks are performed. To do so, researchers have used different types of frequency scales. At least two different options are possible when measuring frequency. In the first, a frequency estimate is made using highly specific time-based estimates (e.g., from "about once per year" to "about once each hour or more often"). In the second, a less specific estimate is provided (e.g., from "never" to "very often"). We are not aware of any research that has directly compared these two different types of frequency scales, but we have used both in our research with good results. We have found that sometimes respondents have difficulty making the highly specific frequency estimates. In some ways, it is almost too precise, given the way workers often view their job. We have more to say about the complexity of the judgments often made in work analysis a little bit later.

One frequency scale that seems to have fallen somewhat out of favor is the relative time-spent scale. This could be due, in part, to the criticisms leveled against this kind of scaling by Harvey (1991), who suggested that such a "within-job relative" rating scale (e.g., the time spent on a particular task

TABLE 1.2

Commonly Used Job Analysis Rating Scales

Type of rating scale	Anchors
Frequency	
"I perform this task . . ." (Gael, 1983)	1 = *about once per year*, 2 = *about once every six months or less*, 3 = *about once each month*, 4 = *about once each week*, 5 = *about every other day*, 6 = *about every day or more often (not each hour)*, and 7 = *about once each hour or more often*
"I perform this task . . ." (Drauden, 1988)	0 = *never*, 1 = *rarely*, 2 = *occasionally*, 3 = *sometimes*, 4 = *often*, and 5 = *very often*
Importance	
"How important is this task to the performance of your present job?"	1 = *not important*, 2 = *somewhat important*, 3 = *important*, 4 = *very important*, and 5 = *extremely important*
Criticality–consequence of error	
"Indicate the degree to which an incorrect performance would result in negative consequences." (Brannick, Levine, & Morgeson, 2007)	1 = *consequences of error are not at all important*, 2 = *consequences of error are of little importance*, 3 = *consequences are of some importance*, 4 = *consequences are moderately important*, 5 = *consequences are important*, 6 = *consequences are very important*, and 7 = *consequences are extremely important*
Task difficulty	
"Indicate the difficulty in doing a task correctly relative to all other tasks within a single job." (Brannick et al., 2007)	1 = *one of the easiest of all tasks*, 2 = *considerably easier than most tasks*, 3 = *easier than most tasks performed*, 4 = *approximately ½ tasks are more difficult, ½ less*, and 5 = *harder than most tasks performed*
Required on entry	
"Review each task statement and ask yourself the following question: 'When is a new employee expected to be able to possess this knowledge or skill?' "	1 = *not expected to possess immediately, but after formal training is provided*, 2 = *not expected to possess immediately, but can be quickly learned on the job*, and 3 = *should be able to possess immediately*

compared with the time spent on other tasks) makes cross-job comparisons problematic. It is interesting to note that research has found that relative time spent and both absolute and relative frequency scales provide largely the same information (Friedman, 1990, 1991; Manson, Levine, & Brannick, 2000). Although this does not speak to making cross-job comparisons, it does suggest that within a job, any of these frequency scales are likely equivalent.

In addition to frequency, it is often useful to obtain estimates about the importance of particular tasks to the overall work role. At least two different strategies have been used in past research. In the first, judgments of criticality or consequences of error (the extent to which the incorrect performance of a task would result in negative consequences) and difficulty (how hard it is to perform a task correctly) are combined into an overall index of importance (Sanchez & Levine, 1989). In the second, the importance of a task is directly estimated by simply asking how important the task is to performance on the job. Research has shown that direct estimates are as reliable as composites of difficulty and criticality (Sanchez & Fraser, 1992).

Although the preceding rating scales have typically been used in the context of task questionnaires (and more generally in activity-based work analysis), attribute-oriented work analysis efforts have also used the questionnaire method. Of the rating scales described above, only minor modifications would be needed to adapt them for use with attribute descriptors. For example, instead of referencing the frequency of task performance, the rating scale could reference the frequency with which knowledge or skills are needed on the job. A similar adjustment can be made for importance. In fact, importance rating scales have been used in both the PAQ and O*NET.

There are, however, some rating scales that take on particular relevance in attribute questionnaires. For example, a key question when conducting work analysis for the purposes of developing a selection system is the extent to which a particular attribute is needed at the point of entry (hiring) or whether it can be learned (trained) on the job. This can provide input into which attributes to focus on during selection assessments (but also note the same question could be asked about when a worker is expected to be able to perform tasks) and which to include in formal training programs.

The final rating scale we discuss is not included in Table 1.2 but is particularly salient to attribute-oriented questionnaires. This is the level of the attribute that is required by the job. Originally developed for use in Fleishman's Ability Requirements Scales (Fleishman, 1992), its use has been extended to multiple domains in O*NET. The basic idea is that any work role has a particular amount or level of ability or skill needed for effective performance. In practice, level rating scales range from low to high but typically use behavioral anchors that are illustrative of different levels of the attribute. For example, the ability of "reaction time" (defined as the ability to quickly respond [with the hand, finger, or foot] to a signal [sound, light, picture] when it appears) could have anchors for low, moderate, and high levels of ability as follows: "start to slow down the car when a traffic light turns yellow," "throw a switch when a red warning light goes off," and "hit the brake when a pedestrian steps in front of the car," respectively.

Despite the distinctions that are made among these different rating scales, there is evidence that many of these distinctions are often lost on the workers who complete work analysis questionnaires. For example, although level and importance rating scales are quite different conceptually, in the initial pilot test of O*NET (Peterson, Mumford, Borman, Jeanneret, & Fleishman, 1999), level and importance scales were often highly correlated (in the low .90s). The rating scales of importance and criticality have also shown high overlap (*rs* > .80), whereas correlations between difficulty to learn ratings and importance and criticality ratings have ranged from moderate to high (*rs* from .37 to .77; Manson et al., 2000; Sanchez & Fraser, 1992; Sanchez & Levine, 1989). Finally, a meta-analysis by Dierdorff and Wilson (2003) showed variability in interrater reliability estimates of ratings using importance ($r = .71$), frequency ($r = .69$), difficulty ($r = .63$), and time-spent ($r = .67$) scales, but the 80% confidence intervals for these estimates were overlapping, indicating a lack of significant differences. In total, this evidence suggests that despite their conceptual independence, respondents who complete work analysis surveys

are not always able to make the same sort of fine distinctions that are prompted by different rating scales. This suggests that if multiple response scales are to be used, then they should be chosen so as to minimize redundancy and ensure alignment with the intended purposes of the work analysis.

Source

Once a method is determined, the next choice involves deciding the source of the work analysis information. Common sources include written documentation, role incumbents, technical experts, supervisors, clients, and job analysts. A wide variety of written documentation can be used to support a work analysis effort. This would include such things as existing job descriptions, previous work analyses, published information about the work role (e.g., from publicly available databases, such as O*NET), training manuals or other documents used to prepare workers for the role, and checklists or operating guides for any of the equipment, tools, or other work aids. Collecting this kind of documentation is typically the first step in the work analysis, as one seeks to compile all the known information about the work role. One benefit of this source of information is that its collection can be very cost efficient. However, the work analysis practitioner must be aware that existing documentation could be outdated or may lack sufficient depth or breadth to be useful for the intended purpose of the work analysis.

Role incumbents are another useful source of work analysis information. Incumbents are a useful source of information because of their familiarity with the role and specific knowledge about what is done on a day to day basis. However, some incumbents may not be able to effectively articulate exactly what they do, either because of a lack of verbal ability or a lack of motivation to provide accurate and reliable information. Technical experts are individuals who do not perform the role but have some sort of specialized expertise with the work that is performed. Examples might include engineers who design a manufacturing process, chemists who study the effects of drug interactions, lawyers who write and approve contracts, or professors who are experts in the discipline that underlies the work being studied. Such experts are likely to provide an important perspective on the technical aspects of the work, particularly in terms of ideal system functioning.

Supervisors (either the immediate supervisor or a higher level manager) can also provide a useful perspective on the work role requirements. Supervisors may have a higher level of verbal ability than incumbents and thus might be able to provide work role information that incumbents are unable to articulate effectively. In addition, supervisors are probably less motivated to distort or otherwise bias the information they provide. Finally, given their hierarchical position, they are likely to have a broader perspective with respect to differences among the work roles and the attributes needed for successful role performance. Despite these positive features, however, one major problem with supervisors as a source is that they may have less detailed and nuanced information about the work role because they do not actually perform the work (and may not even know how to perform the work).

Work analysts are another source of information. These can be either HR professionals inside the organization who have expertise and training in work analysis methods or outside consultants or experts. In a typical work analysis, work analysts serve an integrative role by designing and implementing the variety of methods discussed earlier. Some advantages of work analysts are that they tend to produce highly reliable ratings, have no (or little) motivation to bias the results, and are able to integrate the large amounts of information that typically result from a thorough work analysis. However, unless they accumulate enough information about the work, work analysts may lack adequate information to make good decisions. Finally, because experienced work analysts often have prior exposure to similar work roles, they may be subject to preexisting stereotypes about the work. Unless they are careful, their decisions may be influenced by their stereotypes instead of the actual work itself.

Although one could choose to use only one (or a subset) of these sources when conducting a work analysis, in practice, a comprehensive work analysis would entail using all sources to varying degrees. In addition to capturing different perspectives of the work role under examination, using multiple sources may have the added benefit of producing higher

quality work analysis information, as some research has shown differences across different data sources (e.g., Dierdorff & Wilson, 2003). A process commonly used in practice is to begin by reviewing existing written documentation. This documentation then informs subsequent data collection from role incumbents and technical experts. Supervisors then check and augment the data collected from incumbents and experts. Analysts then compile all the information (and likely were intimately involved in collecting the data) and draw relevant conclusions. Such an approach is often highly effective because it provides a more accurate description of the work and worker requirements. In addition, by gathering input from the relevant stakeholders, it can enhance acceptance of any HR system that is built from the findings of the work analysis.

Purpose of Work Analysis

As noted at the beginning of this section (and implicitly throughout), the choices made when designing and conducting a work analysis depend on the reason or purpose of the work analysis. There are numerous reasons why one might conduct a work analysis, including selection system development, job and team design, performance management system design, training system development, compensation system development, and career management systems. Because a comprehensive review of these purposes is beyond the scope of this chapter (see Ash, 1988; Brannick et al., 2007; McCormick, 1979, for complete lists), we have chosen to focus on what goes into making such choices and providing some selective examples.

Perhaps the most important consideration when making work analysis choices is how the information will be used. For example, conducting a work analysis to determine what kinds of selection tools to use would place a priority on identifying the attributes (e.g., knowledge, skill, ability, other characteristics) needed to effectively perform the work and the extent to which certain attributes (e.g., skills) are needed immediately on the job and others can be learned once on the job. Conducting a work analysis for developing a new training program, however, would place a premium on the activities performed, in part because the activities form the core of the training program content. If the intention is to carry out a work analysis to produce information for job descriptions–specifications, then emphasis would be on a full breadth of descriptors (activities, attributes, and context), with attention paid to ascertaining the importance of these descriptors to role performance. As these examples illustrate, the ultimate use of the work analysis information plays a major part in any decisions that are made.

Beyond the use of the information, several other ancillary considerations deserve mention, including quality, cost, acceptability, and legal defensibility. Although one would always like to obtain as high a quality of information as possible, quality considerations often must be balanced against cost considerations. All else being equal, the highest quality work analysis information will be the most costly. Organizations often have to make pragmatic decisions about when a work analysis is good enough. We return to issues of quality in more detail in a subsequent section. Acceptability is another important consideration, particularly if the work analysis has major implications for current workers. For example, if a work analysis is being conducted to redesign jobs or determine pay levels, then choices should be made to include the interested parties wherever possible. Interested parties can include incumbents whose jobs are being redesigned or whose pay is being affected and labor unions who represent job incumbents. A final consideration would be legal defensibility. If one were conducting a work analysis in an environment where the resulting HR system might be subject to legal challenge, fully documenting a detailed and thorough (i.e., high quality) work analysis would be advised. For example, if a work analysis is being conducted to revise a performance management system where there have been allegations of gender discrimination, then a complete and thorough work analysis would need to be carefully documented.

O*NET

Arguably the most significant innovation in work analysis of the past several decades has been the development of O*NET by the U.S. Department of Labor. Although other occupational classification

systems exist both in North America (e.g., Canada's National Occupation Classification) and in Europe (e.g., International Standard of Occupational Classification and EurOccupations), O*NET encompasses the broadest scope of work information ranging from labor market data and wages to important knowledge, skills, and required tasks. As such, O*NET is a comprehensive system of occupational information designed to replace the *Dictionary of Occupational Titles* (*DOT*), which was first published in 1939. There were numerous reasons why the *DOT* was in need of replacement (Dunnette, 1999). Most salient among these reasons were (a) the lack of information to allow cross-job comparisons, which permit classification and determination of similarities and differences across a variety of work roles; (b) the primary focus on task information to the exclusion of other important work role requirements, such as knowledge, skills, abilities, and traits; (c) the limited description of the conditions under which work is performed (e.g., the *DOT* mainly described aspects of the physical context); and (d) the numerous difficulties of maintaining the currency of the information in a rapidly changing world of work. A special panel was commissioned by the federal government (Advisory Panel for the Dictionary of Occupational Titles, or APDOT) to review these issues surrounding the *DOT* and to offer recommendations for improvement and alternative approaches. As a result, APDOT released a final report (APDOT, 1993) that outlined a roadmap toward creating what would later become O*NET. For more details regarding how this process unfolded, readers are encouraged to consult Dunnette (1999) and Dye and Silver (1999).

At the heart of O*NET is its content model, which theoretically organizes the wide variety of information that can be used to describe the world of work. The content model is shown in Figure 1.3 and comprises six major areas: worker characteristics, worker requirements, experience requirements, occupation requirements, workforce characteristics, and occupation-specific information (Mumford & Peterson, 1999; Peterson et al., 2001). Of importance, this structure enables a focus on areas that describe important attributes and characteristics of both workers and the work itself. Table 1.3 displays the types of descriptors that fall within each domain of the content model. Also shown in the table are the conceptual categories of these descriptors and the sources from which data are collected. More specific information may be found in Peterson et al. (2001) or at O*NET OnLine (see http://online.onetcenter.org).

With regard to the field of work analysis, several features of the content model are especially noteworthy. First, the model represents a comprehensive way to conceptualize virtually all of the types of work-related data that are of interest to both individuals and organizations. For example, the model subsumes

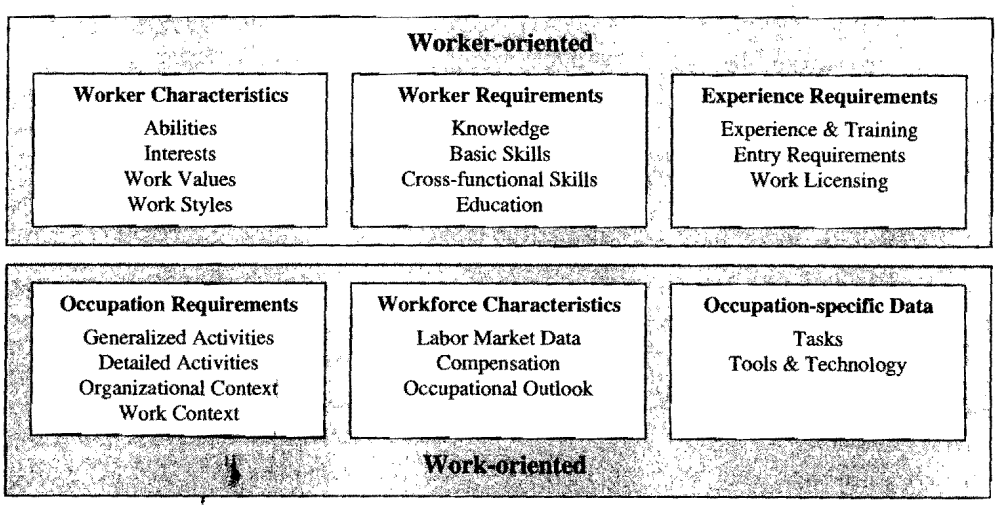

FIGURE 1.3. Content model for the Occupational Information Network.

TABLE 1.3

Content Model Descriptor Types and Categories

Domain and descriptor type	Descriptor categories or details	Data source
Occupation requirements		
Generalized work activities	Information input, mental processes, work output, and interacting with others	Role incumbents
Detailed work activities	2,165 activities (e.g., administer medications or treatments, analyze psychological testing data, prepare records of customer charges)	Analysts
Work context	Interpersonal relationships, physical work conditions, and structural job characteristics	Role incumbents
Organizational context	Organizational structure, human resources systems and practices, goals, roles at work, culture, and role of supervisors	Not currently collected
Worker requirements		
Basic skills	Content skills and process skills	Role incumbents
Cross-functional skills	Social skills, complex problem-solving skills, technical skills, systems skills, and resource management skills	Role incumbents, analysts
Knowledge	Business and management, manufacturing and production, engineering and technology, mathematics and science, health services, education and training, arts and humanities, law and public safety, communications, and transportation	Role incumbents, analysts
Education	Required level of education, instructional program required, and educational level in specific subjects	Bureau of Labor Statistics and Department of Education (third category not collected)
Worker characteristics		
Abilities	Cognitive abilities, psychomotor abilities, physical abilities, and sensory abilities	Analysts
Work styles	Achievement orientation, social influence, interpersonal orientation, adjustment, conscientiousness, independence, and practical intelligence	Role incumbents
Occupational interests	Realistic, investigative, artistic, social, enterprising, and conventional	Analysts
Occupational values	Achievement, working conditions, recognition, relationships, support, and independence	Analysts
Occupation-specific information		
Tasks	25–30 tasks per occupation	Role incumbents
Tools and technology	25,000+ equipment, tools, machines, software, and other information technology	Analysts
Workforce characteristics		
Labor market information	Wages, employment statistics, and so forth	Bureau of Labor Statistics
Occupational outlook	Employment projections (e.g., growth, shrinkage)	Bureau of Labor Statistics
Experience requirements		
Experience and training	Related work experience and on-the-job training	Office of Apprenticeship and role incumbents
Basic skill entry requirements		Not currently collected
Cross-functional skill entry requirements		Not currently collected
Licensing		Office of Apprenticeship

labor market data, wages, and occupational forecasts, as well as the attribute and activity requirements necessary for occupational performance. Second, the model posits a taxonomic structure for most of its domains. For instance, the worker characteristic domain of abilities is grouped into four broad categories, with more specific abilities contained within each grouping. This taxonomic approach is beneficial primarily because it directly incorporates multiple levels of data specificity. This is valuable because it allows one to choose between various levels of specificity in a particular domain, depending on the intended use of the information.

Third, the model establishes a common language with which to describe the world of work. Using standardized descriptors is essential for cross-occupation comparisons that seek to identify similarities or differences between occupations. The benefits of a common language are numerous, in part because it can serve as a unifying force that eliminates the potential confusion that is created when a host of similar descriptors are used to capture work role requirements.

Finally, the model also allows for occupation-specific information, such as detailed task information, wage information, and so forth. Such occupation-specific data were central to the original *DOT*. Of importance, the incorporation of this type of information ensures that, in addition to more molar cross-occupational comparisons, more molecular within-occupation descriptions are possible. Further, occupation-specific data are necessary for a number of HR purposes, such as developing training programs or generating position descriptions (Sager, Mumford, Baughman, & Childs, 1999).

Using O*NET in Practice

In addition to characteristics of the content model described above, the information contained within the O*NET database holds particular value for the HR practitioner. First, the information is nationally representative of the U.S. workforce and is "fresh" in the sense that it has been collected in the past 7 years, with nearly three quarters of the occupations updated since 2005. Second, the data available in the O*NET system are more descriptive than information typically found in the products of many work analyses in practice (e.g., job descriptions and specifications). As an example, consider the ambiguity and widely variant levels of specificity of the descriptors commonly found in online job postings. O*NET provides descriptors that are clearly defined and theoretically based.

As we discussed earlier, a single right way to conduct work analysis does not exist, but, rather, the chosen approach must be congruent with the ultimate uses of the collected information. Likewise, it would be a mistake to suggest that there is only one way to effectively use O*NET in practice. With that said, we believe O*NET can make a substantial contribution to improving the effectiveness of work analysis in practice. This is probably best accomplished by utilizing O*NET as a starting point for work analysis efforts. The O*NET database would then serve as a foundation upon which to undertake one's own work analysis, regardless of the ultimate purpose. Following this logic, a practitioner would first consult O*NET to locate the relevant occupation(s) matching the focal role(s) of his or her work analysis, as well as the desired descriptors most relevant to the intended purpose (e.g., tasks and/or skills for designing training programs, skills and/or traits for choosing selection instruments). Then, the practitioner would use these data to inform their own in-house data collection efforts, whether these efforts are as simple as SME or incumbent verification of existing O*NET information (through ratings, rankings) or as complex as customized initiatives that seek to generate more company-specific information to augment O*NET data (e.g., knowledge germane to particular software systems, responsibilities or activities described in the language of a particular business function or department, etc.). In this sense, O*NET can provide generalizable data to help ground and facilitate local work analysis projects. Considering that work analysis results are frequently the key components to establishing content-related validity evidence, coupling local work analysis results with information from the nationally representative O*NET database may bolster the defensibility of decisions based on such evidence.

Recent O*NET Developments

Since its initial pilot testing and development (see Peterson et al., 1999, 2001, for greater details), O*NET has undergone a number of important revisions, updates, and additions. First, the occupational coding scheme for O*NET has been aligned with the Bureau of Labor Statistics's Standard Occupational Classification system (available from http://www.bls.gov/SOC) to ensure compliance with the requirements of all federal statistical agencies reporting occupational data (Levine, Nottingham, Paige, & Lewis, 2000). These coding changes have adjusted the total number of occupations in the O*NET system to 949, of which 812 were included in data collection efforts as of 2006. This represents a significant departure from the roughly 12,000 titles in the *DOT* and the 1,120 titles in the early versions of the O*NET database.

Second, the original O*NET database was populated with analyst ratings. Several domains in the O*NET database have subsequently been updated on a semiannual basis with ratings collected from role incumbents, as noted in the previous section. Publication of these data derived from incumbents began in 2003 and continues today. Thus far, the vast majority (96%) of the 812 data-level occupations have been updated with incumbent data.

Third, new data pertaining to the variety of tools and technology needed for occupational performance have been recently added to the O*NET database (Brendle, Rivkin, & Lewis, 2008). Currently, tools and technology information have been generated for 327 occupations, with 427 occupations (53%) slated for completion by 2008. Over 25,000 tools and technology objects have been collected thus far, making this portion of the O*NET database the largest in terms of sheer volume. The number of objects per occupation range from 12 to 300. In general, "tools" refer to machine, equipment, and tools, whereas "technology" refers to software. Table 1.4 shows examples of tools and technology for several occupa-

TABLE 1.4

Examples of O*NET Tools and Technology

Tools and technology objects	UNSPSC classification
Surveying technicians	
Electrotapes, measuring chains, tellurometers	Distance meters
Echosounders, fathometers	Sonars
Total stations, Tribrach level bubble adjusting blocks, Tribrach optical plummet adjusting cylinders	Theodolities
MicroSurvey FieldGenius, Survey Starnet Software	Database reporting software
ESRI ArcView, Geomechanical design analysis GDA software	Map creation software
Anesthesiologists	
Intra-arterial catheters, Swan Ganz artery catheters	Arterial line catheters
Precordial stethoscopes, pretracheal stethoscopes	Electronic stethoscopes or accessories
AetherPalm InfusiCalc, Skyscape 5-Minute Clinical Consult	Medical software
EDImis Anesthesia Manager, Healthpac Computer Systems H2000 Anesthesia Billing Software	Accounting software
Marketing managers	
ClickTracks software, online advertising reporting software	Analytical or scientific software
Atlas OnePoint GO TOAST, Microsoft Project	Project management software
Accountants	
Best MIP Fund Accounting, Intuit QuickBooks, Sage CPAPractice Manager	Accounting software
ACCUCert software, Intrax ProcedureNet, tax compliance property tax management software	Compliance software
AuditWare software, Cartesis Magnitude iAnalysis, fixed-assets depreciation software	Financial analysis software

Note. Classifications are from the lowest level of the United Nations Standard Products and Services Code (UNSPSC) taxonomy (available at http://www.unspsc.org). O*NET = Occupational Information Network.

tions. Because of the substantial number of objects, as well as the hierarchical structure that underlies O*NET data, a critical need is to organize the tools and technology information. Currently, the tools and technology data are classified according to an existing and established taxonomy entitled the United Nations Standard Products and Services Code (available from www.unspsc.org). Of importance, the use of this taxonomy allows for cross-occupational comparisons and further promotes the common language approach inherent in the O*NET content model.

A final recent O*NET development is interesting to note. To reiterate, one of the key recommendations in the aforementioned APDOT report was the need to maintain currency in occupational information. To accomplish this, efforts have been made to identify what are termed "new and emerging" occupations (Dierdorff, Cantwell, & Nottingham, 2008). Such occupations (a) involve significantly different work than that performed by incumbents of other preexisting occupations and (b) are not adequately reflected in the current O*NET system. Efforts to identify new and emerging occupations are focused on specific industries or sectors that have been deemed as "high growth" by the Department of Labor's Employment and Training Administration. High-growth industries are those sectors projected to add substantial numbers of new jobs or affect the growth of other industries or that have existing or emerging businesses that are being transformed by technology and innovation, requiring new skill sets (Dierdorff et al., 2008). Table 1.5 shows examples of these high-growth industries as well as examples of new and emerging occupations that have been identified for inclusion in the O*NET database. As of 2008, 102 new and emerging occupations have been generated. For work analysis in general, these efforts focused on identifying and describing new and emerging occupations highlight the value of attending to more molar forces at the labor market and economic levels that shape the way work is performed but are rarely addressed in work analysis practice.

O*NET: Some Remaining Questions

The O*NET system represents the most significant theoretical development in work analysis in recent history and reflects the cumulative expertise of over 50 years of work analysis research (Campion, Morgeson, & Mayfield, 1999). The developments described in the previous section also suggest that efforts to improve, update, and extend O*NET appear promising. Nonetheless, certain areas are in need of further attention. We highlight a few of these in the next several paragraphs.

Although the core of the O*NET system grew out of an extensive pilot study that sought to offer reliability, validity, and other evaluative evidence for the domains covered by the content model (Peterson et al., 1999), there has been little published empirical research in the more than 10 years since this developmental research was undertaken. For example, much of the basic research conducted in the pilot study has yet to be replicated (and extended) on the current database. This research includes examinations of reliability, discriminability, and underlying factor structures of the present O*NET database, which now has several domains based on role incumbent ratings as well as analyst ratings. Such research is essential to the broader field of work analysis, considering that O*NET represents our state-of-the-art practices. The little research that has been conducted has focused on applications of O*NET data or uses of O*NET data in other non-work-analysis investigations.

One example of application-oriented research is a study by Jeanneret and Strong (2003) that examined the utility of using select generalized work activities from O*NET for estimating job component validity. These authors showed positive evidence that O*NET descriptors were significantly predictive of general cognitive ability (via General Aptitude Test Battery and Wonderlic test scores). LaPolice, Carter, and Johnson (2008) described another study using a job component validity approach, which is a validation technique where relationships between quantitative work analysis data (e.g., levels of skills required by the job) and test scores of role incumbents are assessed across various jobs. This research supported the usefulness of O*NET knowledge, skill, ability, and generalized work activity data in predicting adult literacy test scores. A third example of O*NET application research is a study conducted by Converse, Oswald, Gillespie, Field, and Bizot (2004), in which they

TABLE 1.5

O*NET New and Emerging Occupations

High-growth industry	New and emerging occupation	Definition
Advanced manufacturing	Mechatronics engineers	Apply knowledge of mechanical, electrical, and computer engineering theory and methods to the design of automation, intelligent systems, smart devices, or industrial systems control.
Automotive	Fuel cell engineers	Design, evaluate, modify, and construct fuel cell components and systems for transportation, stationary, or portable applications.
Biotechnology	Geneticists	Research and study the inheritance of traits at the molecular, organism, or population level. May evaluate or treat patients with genetic disorders.
Construction	Nondestructive testing specialists	Test the safety of structures, vehicles, or vessels using radiograph (X-ray), ultrasound, fiber optic, or related equipment.
Energy	Energy auditors	Conduct energy audits of buildings, building systems, and process systems. May also conduct investment grade audits of buildings or systems.
Financial services	Risk management specialists	Analyze company balance sheets and apply mathematical models to calculate risk associated with trading or credit transactions.
Geospatial technology	Geodetic surveyors	Measure large areas of the Earth's surface using satellite observations, global positioning systems, light detection and ranging, or related sources.
Health care	Cytotechnologists	Stain, mount, and study cells to detect evidence of cancer, hormonal abnormalities, and other pathological conditions following established standards and practices.
Homeland security	Intelligence analysts	Gather, analyze, and evaluate information from a variety of sources, such as law enforcement databases, surveillance, intelligence networks, and geographic information systems. Use data to anticipate and prevent organized crime activities, such as terrorism.
Hospitality	Spa managers	Plan, direct, or coordinate activities of a spa facility. Coordinate programs, schedule and direct staff, and oversee financial activities.
Nanotechnology	Nanosystems engineers	Design, develop, and supervise the production of materials, devices, and systems of unique molecular or macromolecular composition, applying principles of nanoscale physics and electrical, chemical, and biological engineering.
Retail trade	Loss prevention managers	Plan and direct policies, procedures, or systems to prevent the loss of assets. Determine risk exposure or potential liability and develop risk control measures.
Transportation	Logistics engineers	Design and analyze operational solutions for projects such as transportation optimization, network modeling, process and methods analysis, cost containment, capacity enhancement, routing and shipment optimization, and information management.

Note. High-growth industries identified by the U.S. Department of Labor's Employment and Training Administration. O*NET = Occupational Information Network.

outlined and evaluated a process for career guidance that matched individuals to occupations using O*NET abilities. Finally, Reiter-Palmon, Brown, Sandall, Buboltz, and Nimps (2006) described research that used O*NET data in the development and implementation of a Web-based work analysis process.

In terms of research that centrally focuses on O*NET itself, rather than its applications, even fewer studies have been conducted. One example is research conducted by Hadden, Kravets, and Muntaner (2004), who used exploratory factor analysis to examine a version of the O*NET database populated with analyst ratings. The authors found evidence that this database possessed a factor structure that was comparable with the *DOT*. Because this study was conducted with the older, analyst-version of the O*NET database, no conclusions can be made regarding the factor structure of the current incumbent-populated database. Another study by Eggerth, Bowles, Tunick, and Andrew (2005) examined the convergent validity of O*NET occupational interests (also analyst derived) as compared with the *DOT* Holland codes and the Strong Interest Inventory. These authors found varying levels of agreement in the scores produced across the three instruments, with the highest agreement levels between O*NET and the *DOT* and Strong Interest Inventory scores.

Finally, Dierdorff and Morgeson (2009) provided the only study to date that directly investigates incumbent ratings from the O*NET database. These authors used variance component analysis and meta-analysis to examine sources of variance and interrater reliability of ratings on O*NET tasks, generalized work activities, knowledge, skills, and work styles (traits). Variance component analysis was used to partition rating variance into two sources: (a) variance due to the item (i.e., "true" differences) and (b) variance due to the rater (i.e., idiosyncratic differences). Using data collected from job incumbents across 309 occupations ($N = 41{,}137$), Dierdorff and Morgeson found that larger proportions of variance (more than twice the amount) were generally attributable to items rather than to raters. The one exception to this general trend was for rating of work styles, where the opposite finding was evident (i.e., twice as much variance was due to the rater). Meta-analysis showed similar results, with lower interrater reliability for work style ratings, suggesting that incumbents are likely to show lower consensus when rating the traits that are important to performing their roles. Taken collectively, the results of this study offer generally favorable results for incumbent ratings of O*NET tasks, generalized work activities, knowledge, and skills.

Broadly speaking, the O*NET-related research evidence accumulated thus far appears to support the quality and viability of the data. However, we believe there are at least three key areas that still require directed treatment. First, the need for additional evaluative research cannot be overstated. Brannick et al. (2007) raised an interesting point of comparison with regard to the predecessor of O*NET when they stated, "despite its limitations, the DOT benefited from many years of research conducted on it" (p. 122). Research investigating topics such as the factor structure underlying O*NET data, relationships between analyst and incumbent ratings, and the uniqueness or redundancy in types of ratings (importance vs. level ratings) are broad examples of such empirical needs. Second, more work is necessary to further explicate the efficacy of applying O*NET data to the wide variety of HR systems (e.g., selection, compensation). With over 3.5 million page views per month of the O*NET OnLine website (Brendle et al., 2008), it would appear that O*NET information is being widely used. In addition, O*NET data are often used by governmental agencies to form various workforce strategy initiatives, such as focused training investments (Dierdorff & Cox, 2008).

However, to our knowledge, there exists no direct evidence of how extensive and for what purposes O*NET is used by organizations. It also is important to note that application-oriented research should focus less on documenting a particular process or describing case studies and instead turn attention to more useful criteria, such as the validity, utility, acceptance, and effectiveness of the systems using O*NET information. Third, it is unclear whether some content model areas for which information is not currently available will be the beneficiaries of

future data collection efforts. For example, the organizational context descriptors (e.g., high performance work practices, culture) developed for O*NET would be particularly valuable not only to work analysis research, but also to many other areas of I/O psychology and management (Campion et al., 1999).

THE QUALITY OF WORK ANALYSIS INFORMATION

Because of its centrality to so many HR systems, considerable research has been focused on ensuring that work analysis data are of high quality. This has been reflected, in part, by research that has focused on the interrater reliability of work analysis data. Moreover, as one might expect, when properly conducted, work analysis data are highly reliable (see Dierdorff & Wilson, 2003, for a meta-analytic summary). However, reliability is only one component of data quality. A bigger issue is the validity and accuracy of work analysis data. In this section, we first discuss how accuracy has been conceptualized in work analysis. Next, we discuss the range of potential influences on work analysis data. Finally, we close with a discussion of the kinds of inferences that are made in work analysis and the resulting inferential leap that is often made when conducting work analysis.

Accuracy in Work Analysis

The issue of the accuracy of work analysis data is a difficult one. In many respects, work is a social construction (as our focus on role enactment emphasizes). As such, it is not clear what is meant by work analysis accuracy. Part of the problem is that most work analysis research has relied on the principles of classical test theory (Campion et al., 1999; Harvey, 1991). Classical test theory would suggest that there is a "true score" for a given work role, that true scores are stable across time, and that measurement variation is error that can be eliminated by aggregating across sources and time (Nunnally & Bernstein, 1994). This has led researchers to aggregate data across sources (e.g., incumbents) to determine the true score for a given role. In this view, work analysis data quality is indexed by estimating interrater reliability.

However, there is considerable reason to believe that the assumptions of classical test theory are inappropriate, in part because there are potentially numerous influences on the quality of work analysis data (Morgeson & Campion, 1997). This has led some to advocate and use a generalizability theory perspective (Sanchez & Levine, 2000; Van Iddekinge et al., 2005). An advantage of generalizability theory is that it enables one to simultaneously estimate multiple sources of measurement error. Despite its advantages (i.e., it allows one to model multiple sources of variance in work analysis data), generalizability theory is also predicated on the notion of a stable true score.

Other work analysis researchers have attempted to assess accuracy more directly by taking steps to identify those who might not be answering correctly. Most of these methods involve the inclusion of specific items or indices to detect such individuals (e.g., carelessness index, Green & Stutzman, 1986; infrequency index, Green & Veres, 1990; veracity items, McCormick, 1960; false reporting index, Pine, 1995). Such indices generally include two types of items: (a) veracity items considered to be requisite and thus performed by all incumbents in a given work role and (b) distractor or "bogus" items considered to be unrelated to the job and never performed by incumbents. Another approach has been to repeat particular items in a rate–rerate approach so as to assess intrarater consistency (Wilson, Harvey, & Macy, 1990). In general, such approaches to assessing accuracy are best suited for collecting work analysis information using the questionnaire method. Although offering the benefit of direct estimation of accuracy (i.e., they represent an unambiguous index of accuracy), these approaches do have some associated costs, such as increasing the overall length of the survey and reducing the face validity of the survey (e.g., respondents may wonder why bogus items are being presented or why items are being "unnecessarily" repeated).

Another perspective on the issue of accuracy in work analysis data was forwarded by Morgeson and Campion (1997). They suggested that instead of focusing on any particular single true score estimate, one could simply index the accuracy of work analysis

data in multiple ways, in part because different sources of inaccuracy have different effects on work analysis data. The implications of this are that only by taking a multidimensional view of accuracy could one begin to understand the quality of the data. They identified six aspects of work analysis data quality. First was interrater reliability, which is the most commonly used measure of data quality in the work analysis domain (Dierdorff & Wilson, 2003). Interrater reliability reflects consistency across raters and indexes rater covariation (Shrout & Fleiss, 1979). Second was interrater agreement, which reflects the absolute level of agreement across raters and thus indexes the degree to which different raters make similar ratings (Kozlowski & Hattrup, 1992). Third was discriminability between jobs, which reflects between-job variance and the ability to distinguish between different jobs. Fourth was dimensionality of factor structures, which reflects the extent to which factor structures are complex or multidimensional. Fifth was mean ratings, which reflects inappropriately elevated or depressed ratings. Sixth was completeness, which reflects the extent to which the work analysis data are complete or comprehensive. Thus, one way to evaluate the accuracy of work analysis data is to focus on a broader set of criteria.

Sources of Variance in Work Analysis Data

Although considerable energy has been devoted to developing work analysis methods that generate reliable and valid data, the bulk of this research rests on the implicit assumption that any error is essentially random in nature. Proceeding from this assumption, most work analysis research has sought to eliminate such error through traditional means, such as using sophisticated sampling strategies and standardizing work analysis materials. However, there is reason to believe that work analysis data are subject to systematic (and predictable) sources of variance. If this is the case, then the traditional ways of controlling error will be ineffective and resulting work analysis data will be inaccurate. We now turn to a brief review of factors that may impact work analysis data. Prior to this discussion, however, it is important to acknowledge that although some of the issues we highlight have been supported in past work analysis research, other issues are more speculative, based on suggestive evidence, and thus require additional research.

Rater influences. Researchers have long acknowledged that certain rater characteristics may influence work analysis outcomes. For example, Madden (1962, 1963) explored the role of job familiarity and E. P. Prien and Saleh (1963) explored the role of job tenure. As Harvey (1991, p. 115) noted, "one cannot simply assume that job analysis ratings will be unaffected by characteristics of the rater." Supporting this conclusion, recent research has demonstrated that a considerable amount of variance in work analysis outcomes is indeed due to rater characteristics. For example, Van Iddekinge et al. (2005) found that 21.6% and 29.1% of the error variance in single-rater reliabilities of knowledge, skill, ability, and other characteristics importance ratings and needed-at-entry ratings (respectively) were attributable to rater idiosyncrasies. As such, it is important to explore how attributes of the raters (or source) can impact work analysis information.

First, general cognitive ability may impact work analysis information in a number of ways. Within the same job, individuals of higher cognitive ability might be able to provide more accurate and complete work analysis information because of their superior job knowledge (Hunter, 1986) of the focal role than those of lower cognitive ability. Cornelius and Lyness (1980) offered additional reasons why cognitive ability might influence the quality of work analysis judgments. In work analysis, respondents are often asked to make inferences or abstract judgments about aspects of the work, or they may be asked to integrate a large amount of information. Because of the cognitive demands of these judgments, those high in cognitive ability have an advantage because of their additional mental resources. These integrative judgments can be viewed as controlled processes (W. Schneider & Shiffrin, 1977), and cognitive ability is highly predictive of success in such processes (Ackerman & Humphreys, 1990). Greater cognitive ability may also result in more accurate work information, because many questionnaires require a high reading level (Ash & Edgell, 1975; Harvey, Friedman, Hakel, & Cornelius, 1988), and cognitive ability is related to education level. Research has supported the

relationship between educational level and reliability or other differences in work analysis data (Cornelius & Lyness, 1980; Fried & Ferris, 1986; Green & Veres, 1990; Landy & Vasey, 1991).

Two caveats should be considered regarding cognitive ability. First, incumbents with noticeably higher cognitive ability may create extraneous information that could lead analysts or supervisors to rate the job requirements higher for these individuals, even though the underlying work is the same. Second, incumbents with higher cognitive ability may have qualitatively different experiences in the work setting because they are assigned (or take on) additional or different (e.g., higher level or more complex) tasks. This could influence the tasks and knowledge, skills, abilities, and other characteristics they generate, as well as ratings of importance and time spent. In support of this, Morgeson, Delaney-Klinger, and Hemingway (2005) recently found that cognitive ability was positively related to the number of tasks performed. These differences may be more pronounced on jobs where there is increased autonomy or opportunity for discretionary behavior.

Second, different personality characteristics may influence work analysis responding in a variety of ways. For example, individuals high in conscientiousness may be more careful and diligent in their responding, resulting in more reliable and accurate responses. Or, individuals high in extraversion may incorporate more socially oriented work elements into their focal role, thereby changing the nature of the work they perform, compared with less extraverted coworkers who are in the same role. Although there have been attempts to systematically measure the personality requirements of work (e.g., Raymark, Schmit, & Guion, 1997), there have been few attempts to explore how different personality characteristics are related to work analysis data. Future research should address this gap.

Another important attribute is work experience. More experienced incumbents may provide more accurate information because they may have greater information and insight into the job. The research evidence is mixed, however, with some studies showing differences (Borman, Dorsey, & Ackerman, 1992; Landy & Vasey, 1991; Sanchez & Fraser, 1992) and others not (Mullins & Kimbrough, 1988; Schmitt & Cohen, 1989; Silverman, Wexley, & Johnson, 1984). Furthermore, some of the differences in work analysis information may be due to differences in the jobs performed by more experienced incumbents.

For example, Borman et al. (1992) found significant differences in 9 of 12 time-spent scores between more and less experienced stockbrokers. It appears that as stockbrokers advance in their careers, they are involved in distinctly different activities, with a relationship-building phase early and a relationship-maintenance phase later. Landy and Vasey (1991) found similar differences for more and less experienced police officers. Finally, Sanchez and Fraser (1992) found that when rating task importance, individuals differentially weight time spent and difficulty of learning as a function of their job experience. However, Mullins and Kimbrough (1988) found no such experience differences for police officers in the generation of critical incidents, although groups were divided into very narrow bands of experience (e.g., each group constituted an increment of only 1 year of experience). Another view of work experience and work analysis has been provided by Richman and Quiñones (1996). They found that less experience with an experimental task was related to more accurate estimates of the frequency with which individual task elements had been performed and correct identification of tasks performed. They suggested that individuals have more difficulty recalling the frequency of specific events if similar events occurred frequently.

Given these mixed findings, understanding the role of work experience in work analysis judgments is an important area of future research. In investigating this issue, however, it would be important to adopt a multidimensional view of work experience. Tesluk and Jacobs (1998) developed a model of work experience that specifies measurement modes of work experience (i.e., amount, time, density, timing, type) and levels of specification (i.e., task, job, work group, organization, career–occupation). Any research on experience should seek to measure multiple aspects of experience, as some (e.g., task, job) may be more logically connected to work analysis than others (e.g., organization, occupation). Future research should also explore different rating scales, as differences in experience may also depend on the rating

scale used. For example, all incumbents may identify the same tasks as critical, regardless of experience, but the amount of time they spend on different tasks may vary with experience. Also, differences with experience may be more pronounced if the jobs have some autonomy or opportunity for discretion in terms of which tasks to perform or the relative emphasis tasks are given.

A final rater attribute that might be important is the performance level of workers. As with the other rater influences, empirical results have been mixed. For instance, Borman et al. (1992) found significant relationships between time-spent ratings and performance of stockbrokers. Mullins and Kimbrough (1988) also found significant differences between low- and high-performing patrolpersons in their importance ratings. In contrast, Wexley and Silverman (1978) found no performance differences in importance and time-spent ratings in a sample of retail store managers. Conley and Sackett (1987) also found no differences in terms of either task generation or ratings of knowledge, skill, and ability between high- and low-performing juvenile officers. Finally, Aamodt, Kimbrough, Keller, and Crawford (1982) found no performance-related differences in the type of critical incident categories generated by residence hall workers.

As with the other attributes, differences in work analysis responses may be due to genuine differences in the jobs performed by higher performing employees. Better employees may be assigned additional or different tasks because they are more able to handle the extra work or as a reward for their high performance. In addition, low performers could be more likely to leave the organization (on a voluntary basis or by being terminated), which would introduce issues of range restriction that might affect relationships between experience and work analysis ratings.

Social and cognitive influences. Although rater attributes have been previously identified as a potential influence on work analysis information, it is only more recently that other potential influences have been identified. In fact, Morgeson and Campion (1997) identified 16 distinct potential social and cognitive sources of inaccuracy. The social sources "are created by normative pressures from the social environment and reflect the fact that individuals act and reside in a social context," whereas the cognitive sources "reflect problems that primarily result from the person as an information processor with distinct limitations" (p. 628). Given the in-depth discussion of these processes in past research (Morgeson & Campion, 1997), we only provide an overview and selected examples. The reader is referred to the original article for a more extended discussion.

Social sources are divided into social influence and self-presentation processes. Social influence processes include three distinct processes that occur when judgments are made in group settings. The first is conformity pressures, which reflects the fact that a group can exert quite a bit of normative influence to reach consensus. For example, in an SME group meeting, there are often strong pressures from a majority of group members to reach a certain conclusion (e.g., a particular aspect of the work is essential). Even if another group member disagrees, it is likely that they will go along because of the pressure for conformity that will exist. The second is extremity shifts (also called "group polarization"), which refers to the tendency for group member opinions to become more extreme following group discussion. The third is motivation loss, which reflects the tendency for individuals to exert less effort when in a group as compared with an individual setting. This can have the unfortunate result of not obtaining all the input of group members, resulting in deficient work analysis information.

Self-presentation processes included three processes that reflect an individual's attempt to present him- or herself in a particular light. The first is impression management, which reflects attempts to present oneself in such a way as to "create and maintain desired perceptions of themselves" (Gardner & Martinko, 1988, p. 321). Incumbents are likely to "inflate" the value of their job, particularly when the outcome of the work analysis might potentially benefit them (e.g., such as when a compensation system is being redesigned). The second is social desirability, which reflects "a need for social approval and acceptance and the belief that this can be attained by means of culturally acceptable and appropriate behaviors" (Marlowe & Crowne, 1961, p. 109). For example, Smith and Hakel (1979) found that incumbents and supervisors displayed considerable response

inflation on socially desirable work analysis items compared with analyst ratings. The third is demand effects, which reflects the tendency of individuals to play the "good subject" role and respond in such a way as to validate external expectations. One might imagine a situation where a work analyst conveys to role holders that a certain set of skills are particularly important, and the role holders subsequently validate this expectation by rating them as highly important.

Cognitive sources are divided into limitations in information-processing systems and biases in information-processing systems. Limitations in information-processing systems include three different processes. The first is information overload, which reflects the fact that human information processing has limits when attempting to process complex or large quantities of information. For example, when confronting numerous, detailed activity and attribute statements in a work analysis questionnaire, respondents may simply be unable to effectively process all the information. The second is heuristics, which reflects the fact that individuals often rely on simplifying heuristics (such as representativeness and availability) when making judgments (Tversky & Kahneman, 1974). Because these heuristics imperfectly mirror reality, they tend to result in inaccurate judgments. The third is categorization, which reflects the fact that individuals tend to organize their experiences into distinct categories. Once categorized, subsequent inferences about the experience are made with respect to the category and not the specific experiences. Thus, if a role holder has concluded that "my work is highly complex," then he or she is likely to make subsequent inferences consistent with this conclusion.

Biases in information-processing systems include seven processes. The first is carelessness, which reflects response distortion due to inattention. For example, work analysis respondents often do not read questionnaire items closely (e.g., they do not realize that an item is reverse coded) or carefully (e.g., they indicate they perform tasks that they could not possibly perform) enough. The second is extraneous information, which can create inaccuracy when information not relevant to the work analysis is somehow included or considered. For example, in a work analysis conducted for the purpose of determining pay levels, knowledge of current pay levels can influence the resulting work analysis information. The third is inadequate information, which refers to situations where raters have incomplete job information. This can occur if inexperienced (or naive) raters are used or if analysts have not conducted a systematic analysis of the work. The fourth is order and contrast effects, which involves the influence of contextual ratings effects, such as order (primacy and recency) and contrast effects. Primacy effects refer to the influence of initial information (e.g., the first interviews conducted by an analyst), whereas recency effects refer to the influence of recent information (e.g., how recently performed tasks might be overly salient). Contrast effects reflect distortions caused by differences between stimuli. For example, if a work analyst had been rating a number of low-level roles, he or she might give inappropriately high ratings to an average-level job because of the implicit contrast between jobs.

The fifth is halo, which occurs when ratings are assigned on the basis of global impressions rather than a systematic consideration of differences among separate categories. One way that halo might affect work analysis is that if the task domain or work behavior is not sampled adequately enough, then there is likely to be more of a reliance on global impressions. The sixth is leniency and severity, which reflects a general response tendency to give consistently high (leniency) or low (severity) ratings. Leniency is more likely in work analysis, in part because of a general reluctance to be overly critical when making work analysis judgments. The seventh is method effects, which reflects the fact that when data are collected through a single method, there can be spurious covariation among responses. This is likely to be an issue in work analyses when the questionnaire method is used and all the data are collected from a single source at a single point in time.

Contextual influences. Another category of factors that may influence work analysis information stems from the context within which work roles are performed. As discussed earlier, aspects of work context are one of the descriptor types that work analysis seeks to understand. Thus, features of work context can be a type of information directly collected during work analysis, such as when

elements of the task, social, and physical environments in which roles are enacted are assessed. In addition, it is important to recognize that contextual forces are also likely to shape how work roles are perceived and ultimately enacted. Katz and Kahn (1978, p. 195) explained this relationship by stating that role enactment "does not occur in isolation; it is itself shaped by additional or contextual factors." In this sense, work context not only shapes how a work role is enacted, but also may serve as a systematic source of variance in work analysis data.

Contextual influences on work analysis information can be examined using an omnibus approach or a discrete approach. Discrete descriptions of work context focus on more specific classes of variables, such as those described earlier (i.e., delineating task, social, and physical elements). In contrast, an omnibus approach entails a broader consideration of contextual influences and "refers to an entity that comprises many features or particulars" (Johns, 2006, p. 391). That is, an omnibus approach accounts for contextual effects using more molar boundary conditions. For instance, one useful entity for studying omnibus context is that of occupation. In relation to how work context may influence variance in work analysis data, a discrete approach might focus on the effects of social context (e.g., role interdependence) on work analysis ratings, whereas an omnibus approach might focus on the organizational effects on ratings (e.g., ratings of similar roles in different companies).

Work analysis research has used both approaches to studying contextual effects. With regard to omnibus context effects, Van Iddekinge et al. (2005) examined whether the error variance in knowledge, skill, ability, and other characteristics ratings were impacted by the organization in which raters worked (these effects were not significant). Another study by Taylor, Li, Shi, and Borman (2008) showed that mean ratings and rank ordering of items from several O*NET domains were quite similar across four different countries. With regard to discrete context effects, Lindell, Claus, Brandt, and Landis (1998) found discrete features of organizations (e.g., size, formalized structure, technology) were correlated with time-spent ratings on tasks (average $r = .32$) but not importance ratings. Finally, Dierdorff, Rubin, and Morgeson (2009) examined both omnibus and discrete context effects on managerial work role requirements. These authors found evidence of omnibus context effects, as the type of managerial occupation (e.g., financial manager, HR manager) accounted for 4% to 39% of the total variability ($p < .01$) in importance ratings on 18 work role requirements spanning responsibility, skills, knowledge, and trait domains. Further, discrete elements from the task, social, and physical contexts (e.g., autonomy, interdependence, hazardous work conditions) accounted for additional variance in these ratings (roughly 18% of between-occupation variance across dimensions of discrete context).

From the accuracy of work analysis data to the quality of work analysis inferences. As the preceding discussion highlights, there are numerous potential influences on work analysis data. In addition to questions about the prevalence of such influences, another question centers around the extent to which any observed variability of work analysis data reflects meaningful differences in role enactment as opposed to error or inaccuracy. Because individuals often enact similar roles in slightly different ways (Biddle, 1979; Graen, 1976; Katz & Kahn, 1978), not all observed differences necessarily reflect inaccuracy. The possibility that some variance in work analysis data may be due to legitimate differences in role enactment introduces another key challenge in understanding work analysis accuracy, leading some to suggest that because work is a social construction, there is no gold standard of accuracy in work analysis (Sanchez & Levine, 2000).

A potential resolution of the dilemma, however, is to shift the focus from the accuracy of work analysis data (which has been the traditional conceptualization) to a focus on the quality of work analysis inferences (Morgeson & Campion, 2000). This is a potentially useful shift for two reasons. First, it is difficult to establish the stability or objectivity of work analysis data. As such, we can only begin to approximate (via some of the criteria discussed above) the accuracy of the data. Second, work analysis data are often completely based on human judgment (Goldstein, Zedeck, & Schneider, 1993). Put another way, "The making of job ratings can be conceptualized as an inferential decision" (Sanchez & Levine, 1994, p. 48), where the process

of inductive inference involves drawing general conclusions from specific examples (Hempel, 1965). Thus, one could begin to describe the different kinds of inferences that are made in work analysis and then develop some means for estimating the quality of the inferences made. Instead of evaluating the quality of work analysis data, one would evaluate the quality of the inferences one is making on the basis of the work analysis data.

The first step in such an endeavor would be to describe the different types of inferences made in work analysis. Morgeson and Campion (2000) developed an integrative framework that identifies three key inferences that specifically occur in work analysis (see Figure 1.4). First, the work descriptive inference involves the extent to which a description of work activities (i.e., tasks and responsibilities) faithfully represents the physical and mental activities underlying role performance. Second, the work specification inference involves the extent to which a specification of worker attributes (i.e., knowledge, skill, ability, and other characteristics) reflects the psychological constructs underlying role-related aptitudes. Third, the operational inference involves the extent to which the identified worker attributes are needed to perform identified work activities.[2] The quality of these inferences could then be evaluated by "deriving theory-based expectations about how scores should behave under various conditions and assessing the extent to which these expectations receive support" (see Aguinis, Mazurkiewicz, & Heggestad, 2009, p. 433).

One implication of this model is that some inferences require a greater inferential leap than other inferences, where the inferential leap in work analysis can be defined as the complexity of the evaluative judgments made about various work role requirements. This complexity is reflected in leaping from observations of work activities to inferences about role requirements. All types of work analysis judgments require some sort of inferential leap, in part because even the most observable aspects of a role (e.g., the performance of very specific tasks) usually

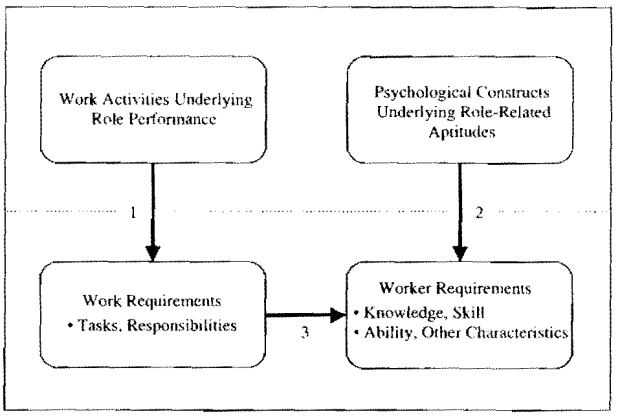

FIGURE 1.4. Key inferences that occur in work analysis. From "Accuracy in Job Analysis: Toward an Inference-Based Model," by F. P. Morgeson and M. A. Campion, 2000, *Journal of Organizational Behavior, 21*, p. 823. Copyright 2000 by John Wiley & Sons, Ltd. Adapted with permission.

require one to move from observable behavior to judgments about such behavior (e.g., frequency of performance, importance to the role). Such a view has been recently recognized and supported in the work analysis literature (e.g., Lievens & Sanchez, 2007; Lievens et al., 2004; Morgeson et al., 2004; Voskuijl & van Sliedregt, 2002).

Recent research by Dierdorff and colleagues (Dierdorff & Morgeson, 2007, 2009; Dierdorff & Rubin, 2007; Dierdorff & Wilson, 2003) has provided some indirect evidence of the inferential leap required by work analysis ratings. This research has shown rating differences attributable to the work descriptor being judged, such as the variation in levels of reliability, carelessness, consensus, and discriminability of work analysis ratings. Broadly speaking, this research suggests that ratings of less specific and directly observable descriptors (e.g., traits) require a larger inferential leap than more molecular and visible descriptors (e.g., tasks). This research also suggests that the inferential leap may systematically vary because of the source (analysts vs. role incumbent) as well as work context (e.g., amount of discretion in one's role).

[2] The operational inference is similar to what Gatewood and Feild (2001) called the "work–worker attribute leap." In addition, Gatewood and Feild described three other types of inferential leaps pertinent to HR activities in general (see also Sanchez & Levine, 2000): (a) the worker attribute–organizational intervention leap, (b) the work–performance measure leap, and (c) the organizational intervention–performance measure leap. Because these latter three types of inferential leaps do not directly deal with the collection of work analysis data but instead refer to the development HR systems (e.g., selection systems), we do not discuss them further.

Understanding the nature of the inferential leap in work analysis is important for at least two reasons. First, as we discussed, work analysis judgments have been typically treated as free from systematic error. However, we now understand that work analysis judgments are subject to various systematic sources of error and inaccuracy (Morgeson et al., 2004; Van Iddekinge et al., 2005). Focusing on work analysis inferences helps us better estimate the quality of our work analyses as well as helps us make appropriate inferences about the data that are collected. Second, the popularity of competency modeling approaches to work analysis (Lucia & Lepsinger, 1999; Schippmann, 1999) has resulted in an increased emphasis on abstract, holistic work descriptors (Schippmann et al., 2000). Focusing on the nature of the inferences made when collecting this type of information helps us better understand the potential limitations that attend the use of such descriptors. For the work analysis practitioner, a better understanding of the types of inferences required and the consequences of these inferences (e.g., changes in levels of consensus and carelessness) can allow for better work analysis design decisions. For example, evidence suggests that incumbents are likely to show lower consensus when rating traits than when rating duties or skills (Dierdorff & Morgeson, 2009). Thus, using analysts to rate trait descriptors, or using multiple types of respondents (incumbents, supervisors, trainers), would be beneficial when capturing judgments about these abstract descriptors.

LOOKING AHEAD: FUTURE AVENUES OF RESEARCH

In this section, we offer a number of potentially fruitful areas for future work analysis researchers to pursue. These suggestions are by no means exhaustive but are intended to address some more traditional areas of work analysis research and to stimulate new thinking in areas not conventionally falling under the purview of work analysis. To accomplish this, we propose topics we believe are potentially fruitful avenues for future research, most of which would be viewed as germane to the field of work analysis. We then discuss several other areas that hold the potential to meaningfully extend work analysis research into other theoretical domains. To the extent possible, we present illustrative research questions throughout the ensuing discussion.

Variance in Work Analysis Ratings

Accumulating empirical evidence shows that considerable variance in work analysis ratings is attributable to idiosyncratic sources as compared with the dimension upon which a work role is being judged (e.g., skills).[3] From a practical standpoint, idiosyncratic variance is generally viewed as undesirable because these rating differences are not due to consensus differences in the target work role and, if large enough, make aggregation of work analysis ratings problematic. Fortunately, recent research has shown that rater training (frame-of-reference training) can be an effective way to decrease idiosyncratic variance in attribute descriptor ratings provided by analysts (Lievens & Sanchez, 2007) and incumbents (Aguinis et al., 2009). These results are promising and suggest that additional research is warranted. Other forms of rater training shown to be effective in the performance appraisal literature, such as rater error training or performance dimension training (see Woehr & Huffcutt, 1994), should also be investigated. In addition, rater training could be applied to other common work analysis inferences, such as judgments about the linkages between tasks and knowledge, skill, ability, and other characteristics for purposes of identifying selection instruments. Of importance, future research should include not only traditional work analysis criteria (e.g., reliability, accuracy), but also criteria relevant to training interventions (e.g., affective outcomes, cost effectiveness).

A second way to approach the idiosyncratic variance found in work analysis ratings is to search for variables that can account for this variation. Future work analysis research could use Morgeson and Campion's (1997) framework discussed earlier to guide such investigations. For example, these authors offer over a dozen specific research propositions, many of which have yet to be subjected to empirical testing. In fact, to date, only two studies have applied

[3] Although, as we discussed earlier, some of the variance is likely to be systematic and explainable.

this conceptual framework to examine potential sources of inaccuracy in work analysis ratings, and both have shown meaningful results (Dierdorff & Rubin, 2007; Morgeson et al., 2004). Beyond these two studies, however, there is substantial research that remains to be conducted using this framework.

A third way to explore variance in work analysis ratings would be to draw from the broader I/O literature to understand some of the factors that might be related to differences in role enactment. This includes work attitudes (e.g., job satisfaction, commitment, fairness perceptions; Conte, Dean, Ringenbach, Moran, & Landy, 2005), the relationship between workers and their immediate supervisors (Hofmann, Morgeson, & Gerras, 2003), the amount of autonomy present in the work (Morgeson, Delaney-Klinger, & Hemingway, 2005), work experience (Borman et al., 1992), and ability (Morgeson, Delaney-Klinger, & Hemingway, 2005). A fuller understanding of how these (and other) factors relate to work analysis ratings would help us better understand the meaning of rating differences and whether differences reflect inaccuracy or meaningful differences in role enactment.

Exploring Relationships Among Different Work Role Requirements

Another avenue for future research is an examination of the relationships among the different work role requirements. Such cross-domain research would include exploring the linkages between attributes and activities. Indeed, fundamental to the majority of theory in I/O psychology (and most fields of psychology) has been the notion that person attributes are antecedent to work behaviors. In this sense, cross-domain research offers valuable information regarding such relationships. Further, the pursuit of a unified theory of performance, which necessarily includes cross-domain specifications, has long been a part of the work analysis tradition (e.g., Fleishman, 1975). An example of this pursuit can be seen in the well-accepted "data–people–things" descriptive framework adopted in the *DOT*. One interesting question is whether this framework still holds in the contemporary world of work. Some empirical evidence indicates that additional factors (e.g., organizational structure) might be required to adequately describe variance in work role requirements (Hadden et al., 2004).

Research that explicates precisely how cross-domain relationships vary across different types of work roles (e.g., occupations) would also be beneficial. Such research not only would increase our theoretical understanding of how attributes link to activities, but also holds promise to improve the practices built from work analysis information. For example, cross-domain specifications are central to job component validity approaches, which seek to analyze the relationship between work analysis data and validity data across various work roles (Jeanneret, 1992). In addition, a better understanding of how cross-domain relationships vary across work roles provides valuable information pertaining to validity generalization (Schmidt & Hunter, 1977), which has long recognized the effects of different occupations on validity estimates (see Ghiselli, 1966). Here, instead of treating occupation as simply a nondifferentiated moderator of validity variability to be subsequently controlled as an artifact, one could extend work analysis information for use in meta-analyses to more meaningfully examine what particular features of occupations are exerting influence (e.g., work context, occupational complexity).

Theory and research falling under the rubric of interactional psychology is a final area that cross-domain work analysis research could inform. In the interactional psychology literature, the importance of considering both the individual and the situation as joint determinants of work behavior has long been encouraged (Block & Block, 1981; Bowers, 1973; Magnussen & Endler, 1977; Terborg, 1981). Because the primary goal of work analysis is to systematically discover work role requirements and the context in which these requirements are enacted, work analysis research is particularly relevant for interactional psychology.

One area to which work analysis research could contribute is a more thorough understanding of how concepts such as situation strength (Mischel, 1977), trait relevance (Tett & Burnett, 2003), and context effects (Johns, 2006) theoretically and empirically

operate to shape work behavior. For example, the notion of situation strength has been criticized for being overly broad and lacking emphasis on important qualitative aspects of context that make a given attribute relevant to role enactment. At the same time, however, both situation strength and trait relevance are necessary for understanding attribute and activity relationships (Tett & Burnett, 2003; Tett & Guterman, 2000). One way future research could empirically examine how these theoretical concepts function is to use work analysis to examine pertinent cross-domain linkages. Here, features of the work context (e.g., facets of task, social, or physical context) would represent varying levels of situation strength, whereas trait relevance could be systematically varied by testing the relationships between relevant–irrelevant attributes and work behavior.

For example, research could investigate how the strength of social context shapes the relationships between socially relevant attributes (e.g., extraversion, conflict negotiation skills) or irrelevant attributes (e.g., conscientiousness, critical thinking skills) and role behaviors of an interpersonal nature (e.g., helping coworkers, teaching others). Presumably, the efficacy of simultaneously using both the situation strength and trait relevance concepts would be evident if a strong social context exerts greater influence on the relationships between socially relevant attributes (e.g., social orientation) and interpersonal role behaviors (e.g., helping others) when compared with the associations between socially irrelevant attributes and these behaviors.

Models of Role Performance

The above discussion alludes to what we believe may be the most fruitful area into which work analysis theory and research could be extended, namely, how work analytic data can be used to better understand role performance. Although this is not necessarily a new connection when one considers that general theories of performance have been directly based on empirical results from work analyses (e.g., Campbell et al., 1993), nonetheless, there exists today very little cross-fertilization of theory and research between the work analysis and job performance domains. Such connections would be valuable for a number of reasons. First, work analysis is sometimes characterized as simply an atheoretical, descriptive process that is necessitated primarily because of legal codifications (e.g., *Albemarle Paper Co. v. Moody*, 1975) and professional standards (e.g., *Principles for the Validation and Use of Personnel Selection Procedures*; Society for Industrial and Organizational Psychology, 2003). Of course, we believe there are many other reasons why work analysis is crucial to organizations, not the least of which is to improve the decisions made in various HR practices. However, this does suggest that one way to increase value perceptions of work analysis research is to demonstrate how such data relate to individual effectiveness. As authors of work analysis research who have, on numerous occasions, dealt with the "so what" question about our field of study, further justification of why work analysis matters has a certain appeal.

However, there is another reason for extending work analysis theory and research into the performance domain that is perhaps more fundamental than addressing criticisms of work analysis relevance. When research is focused on the definition, measurement, or prediction of performance, it is essentially concerned with the manner with which work role requirements are fulfilled. This notion is consistent, for example, with the contrast between work analysis as identifying requisite role behaviors and performance appraisal as identifying which of these behaviors are to be subject to evaluation (i.e., deemed valuable by the organization or its agents). The key idea here is that work analytic data, which are purposefully derived to discover the requirements of work role enactment, can therefore be meaningfully brought to bear within any related research that examines the nature of job performance or attempts to account for performance differences across individuals. Furthermore, there are several ways to link work analysis data to performance data at the multiple levels that are typically of interest to organizational researchers (i.e., individual, team, and organizational). Cognitive task analysis approaches could also be potentially useful, as they focus on discovering differences between experts and novices, which is another way to conceptualize antecedents to superior performance.

Work Analysis and Organizational Performance

At the organizational or firm level, future research could examine how work analysis contributes to so-called high-performance work practices (HPWP). Such practices have included different recruitment strategies, systematic personnel selection, strategic training, performance management systems, a variety of different compensation systems, use of teams, and HR planning (Huselid, 1995; Pfeffer, 1998), all of which are purported to increase individuals' knowledge, skills, and motivation for the benefit of the organization (Becker & Huselid, 1998). Several studies have provided supportive empirical evidence that HPWP are associated with organizational performance, including reduced turnover and increased sales, profits, and market value (Delaney & Huselid, 1996; Huselid, 1995; Huselid, Jackson, & Schuler, 1997).

The role of work analysis as an element of HPWP, however, has been uneven. In some of the seminal research in the area, work analysis was an explicit dimension of "employee skills and organizational structures" (Huselid, 1995, p. 646). In particular, organizations were assessed in terms of "the proportion of the workforce whose job has been subjected to a formal job analysis" (Huselid, 1995, p. 646). In addition, Delery and Doty (1996, p. 834) focused on the nature of job descriptions in use at the organization (e.g., "the duties of this job are clearly defined," "this job has an up-to-date job description," "the job description for this job contains all of the duties performed by individual employees"), which is one fundamental aspect of work analysis. Finally, in more recent research, Toh, Morgeson, and Campion (2008) explored how individual HR practices could be described in terms of coherent bundles of HR practices. In terms of work analysis, these HR practices included the number of selection systems in place that were based on formal work analyses and the number of training programs used that incorporated a careful, systematic training needs analysis.

In other HPWP research, however, the role of work analysis has been neglected. From our standpoint, this is an unfortunate omission for two reasons. First, as past research has shown, work analysis is an important component of HPWP. Second, as this chapter has shown, work analysis underlies all of these HPWP, as it provides the vital data required to effectively create and maintain such systems. Thus, an important opportunity is missed in some HPWP research, namely, the chance to move beyond merely capturing whether these practices are used and instead ascertaining how these practices are built (i.e., on what information they are based).

An additional point regarding work analysis and HPWP research is that this line of future inquiry would be congruent with previous calls for empirical investigation of strategic work analysis (see Sackett & Laczo, 2003). The ultimate goal of strategic work analysis is to forecast work role requirements of new roles that are expected to exist in the future or current roles that are expected to substantially change (Cronshaw, 1998; B. Schneider & Konz, 1989). This more predictive purpose of strategic work analysis holds particular salience to activities surrounding HR planning, which also involves forecasting various human capital needs. Further, recent research indicates that of the variety of specific practices designated as HPWP, HR planning has the largest effects on organizational performance (Combs, Liu, Hall, & Ketchen, 2006). Thus, future work analysis research that examines topics exclusive to strategic work analysis, as well as how this approach relates to effective HR planning, would be quite valuable.

Extending Work Analysis to the Team Level

Virtually all of the past work analysis research has focused on the individual level of analysis. Thus, another potential opportunity exists in extending work analysis research to the team level. In this respect, there are at least three areas of future research. First, work analysis research could pursue the development of a taxonomy of the work role requirements necessary for enacted roles within teams. Although several scholars have identified various requirements needed for team performance (e.g., Campion, Medsker, & Higgs, 1993), these have been primarily concerned with designing teams and determining what characteristics separate effective from ineffective teams. In addition, some attention has been devoted to conducting team task analyses, with a particular emphasis on the importance of

interdependence within a team (Arthur, Edwards, Bell, Villado, & Bennett, 2005). Thus, the opportunity exists for more systematic and comprehensive work analysis efforts seeking to identify those work role requirements germane to working in teams.

Second, work analysis research could examine the validity and generalizability of existing models of team role requirements. For example, Stevens and Campion (1994) outlined 14 different worker requirements (knowledge, skills, abilities) pertinent to teamwork organized into five groupings: (a) conflict resolution, (b) collaborative problem solving, (c) communication, (d) goal setting and performance management, and (e) planning and task coordination. Although this conceptual model was based on an extensive literature review, empirical research examining or using this model remains scarce. However, there is some evidence suggesting these worker requirements do contribute to performance in team settings (Morgeson, Reider, & Campion, 2005; Stevens & Campion, 1994). From a work analysis perspective, it would be interesting to empirically investigate how well this conceptual model actually functions across various work roles that should differ with respect to teamwork characteristics. In other words, one could test whether the model can meaningfully and systematically discriminate between work roles that are embedded in team contexts versus those that are not. For example, one could examine how relationships among the worker requirements specified by the model vary in relation to enacting work roles in more team-oriented contexts (i.e., those with high interdependence, shared goals, etc.). Presumably, the worker requirements specified in the models should be more salient to enacting work roles in more team-oriented contexts.

A third topic for future work analysis research to address is how consensus among individual role holders regarding important work role requirements might impact group or unit effectiveness. Role theorists use the term *consensus* to denote sharedness or agreement among the expectations held by various role holders (Biddle, 1986). At more molar levels, consensus has been thought to lead to more effective integration of social systems (Biddle, 1979) because roles serve the important function of coordinating and integrating the behavior of individuals (Katz & Kahn, 1978). This has led some work analysis researchers to wonder whether greater consensus could result in overall increases in cross-role-holder effectiveness (Dierdorff & Morgeson, 2007). At the same time, some costs might be associated with too much consensus among individual role holders, such as less innovation and creativity. Future research is needed to examine the potential consequences of consensus, or disagreement, for the effective functioning of units or groups.

The Implications of Role Expectations

Conceptualizing work analysis judgments made by role incumbents as representing important expectations regarding how they enact their work roles allows the field of work analysis to expand considerably into other theoretical areas. Role expectations are simply beliefs about what a given role entails (Ilgen & Hollenbeck, 1991) and are important antecedents to role enactment. With regard to work analysis, the content of role expectations is reflected in judgments of various work role requirements (Dierdorff & Morgeson, 2007). Role expectations are important to a number of individual-level outcomes. For example, clarity with regard to one's work role has substantial positive ramifications for job performance, satisfaction, and organizational commitment (Abramis, 1994; Tubre & Collins, 2000). In addition, the breadth with which individuals define their work roles has been shown to impact job performance (Morgeson, Delaney-Klinger, & Hemingway, 2005). The above findings suggest that examining role expectations in particular is a fruitful avenue for future work analysis research.

One area of research in which role expectations are especially relevant is the recent work focused on the effects of role definitions on the performance of organizational citizenship behavior (OCB). Despite its early definition of being extra-role work behavior (Organ, 1988; Organ, Podsakoff, & MacKenzie, 2006), studies have shown that individuals frequently view OCB as falling within the requirements of their work roles (Haworth & Levy, 2001; Hui, Lam, & Law, 2000; Morrison, 1994). As a result, OCB researchers have begun to investigate how OCB role definitions impact whether individuals will engage in OCB (Kamdar, McAllister, & Turban, 2006; McAllister, Kamdar, Morrison, & Turban, 2007).

Work analysis research could meaningfully contribute to this area of inquiry for at least two reasons. First, from its early descriptions, OCB has always been conceptualized as generic work behavior, applicable to a wide variety of work roles (Borman & Penner, 2001). This suggests that such behavior could easily fall within the work role requirements commonly captured in work analysis. For work analysis research, the implication is that OCB research can be meaningfully informed by results from the study of work role requirements. It is interesting to note that the premise that OCB is indeed widely applicable across work roles has yet to be empirically substantiated, which is a question that can be directly addressed by future work analysis research.

Second, OCB role definitions in the extant research are typically operationalized by administering to role incumbents the same measurement scale (or with very slight variation) used to capture subsequent performance of OCB. Such operationalizations of role perceptions seek to ascertain whether employees view OCB as part of their work roles and what consequences this role definition may have on ensuing OCB performance. However, these operationalizations do increase the risk of common method bias, as the same scales are used as antecedents and criteria. An alternative way for work analysis research to study whether role perceptions influence the performance of OCB would be to examine how role expectations affect the enactment of OCB. Here, role expectations could better depict how individuals construe the entirety of their work roles (vs. only if OCB is role related) and could expand to capture role perceptions of both activity and attribute requirements. For example, role expectations regarding activities and attributes that are interpersonal in nature could be examined to determine if they predict whether role incumbents engage in OCB as part of their role enactment.

This approach to focusing on broader role expectations is also consistent with recent suggestions that an individual's orientation toward his or her work role is an encompassing concept that can include various facets, such as passive, strategic, and collective orientations (Parker, 2007). The latter role orientation has particular salience to OCB performance because it pertains to how individuals construe their roles with regard to working with others toward goal attainment. Important to note is that one's orientation and expectations toward one's work role are known to be shaped by features of the work context, such as autonomy and interdependence (Dierdorff & Morgeson, 2007; Parker, 2007). As mentioned earlier, work context descriptors clearly fall within the scope of work analysis. Thus, future work analysis research could test whether features of the work context moderate the potential relationships between role orientations, role expectations, and OCB.

The Role of Context

In addition to the research topics discussed above within different levels of analysis, there are a number of cross-level questions that work analysis research could address. Many of these possible contributions stem from the fact that work analysis research provides a systematic way of describing contextual variables (Dierdorff, 2008). Indeed, several authors have pointed to the difficulties surrounding exactly how to delineate the major elements that comprise context as a major reason for the lack of context-oriented research in I/O psychology and organizational behavior (Hattrup & Jackson, 1996; Johns, 2006). One example of using work analytic data to examine contextual effects can be seen in a recent study by Dierdorff and Ellington (2008). These authors integrated work context information from O*NET into examinations of how the nature of occupational roles shapes whether individuals experience work–family conflict. Other potential areas that could similarly benefit from work analysis research include person–environment fit (e.g., demands–abilities approach; Kristof, 1996) and work design (e.g., moderators of the design characteristics–satisfaction relationship; Morgeson & Humphrey, 2008).

In addition to work context, future work analysis research could examine other broader contextual factors, such as the impact of national culture. Findings from recent research have been equivocal on the influence of national culture. For example, one study found very small effects, suggesting that work analysis data are transportable across cultures (Taylor et al., 2008), whereas another study found national culture to be related to the frequency with

which certain kinds of work behaviors were performed (Shin, Morgeson, & Campion, 2007). These mixed results suggest more research is warranted. In addition to national culture, aspects of organizational culture (e.g., values) would be an example of other broader contextual effects that could be investigated.

Finally, it may be interesting to examine how larger changes that are occurring in the broader world of work might shape the outcomes of work analysis. The impact of globalization, prevalence of interorganizational relationships, use of outsourcing, and reliance on information technology for communication are all examples of shifts in the world of work. Such forces are perhaps unlikely to change the primary goal of work analysis—systematically uncovering activities and attributes and the work context in which roles are performed—but rather these forces could very well impact the salience of the various outcomes of work analysis. For example, the products of work analysis may become even more important for HR planning, where an emphasis is placed on assessing current and forecasting future human capital needs. In addition, practitioners of work analysis may need to be aware of broader forces not normally considered related to work analysis concerns (e.g., changes in industry practices, meta-technology [geospatial, biotechnology, etc.], labor economics) to contextualize their findings for use in organizational strategy and HR management decisions.

CONCLUSION: TOWARD A MORE THEORETICAL VIEW OF WORK ANALYSIS

As we hope this chapter has made clear, work analysis not only has a long history in I/O psychology, but also has a promising future. Our goal was to not only review past research, but also point to numerous opportunities for future research, particularly in areas often not traditionally considered to be the purview of work analysis research. We recognize that many researchers conduct work analysis but may not consider themselves work analysis scholars. In a practical sense, then, future work analysis research would be well-served if those involved in substantive research that relies on work analysis data (e.g., selection researchers) were attuned to the opportunities to incorporate research questions about work analysis in the course of their ongoing efforts.

Perhaps the most pressing issue for future work analysis research, however, is to adopt a more theoretically grounded approach, such that research not only makes a contribution to the practice of work analysis, but also advances theory. Of course, there is considerable historical precedent in work analysis research for such a theoretical grounding. Functional job analysis was based in the data–people–things framework, and the PAQ drew from the stimulus–organism–response paradigm that underlies behaviorism. However, as science has progressed, reliance on such overarching frameworks has decreased in favor of more middle-range theories (Merton, 1949). We feel that middle-range theories hold the most promise for advancing work analysis research. Thus, instead of attempting to develop a theory of work analysis, we advocate that work analysis researchers begin to draw from the numerous theoretical frameworks discussed earlier (e.g., role theory, social and cognitive psychological theory) in their future research efforts. Such an approach is certain to reenergize the field of work analysis.

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