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A Call to Update the DOT: Findings of the IARP Occupational Database Committee

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IARP established the IARP Occupational Database Committee (IODC) in the Spring of 2007 to research and evaluate potential existing databases to replace the *Dictionary of Occupational Titles*. Two such databases were identified: the eDOT from ERI and the McDOT from Vocationology, Inc. The following article discusses the history of the DOT, its many uses, the importance of replacing it with a current database, a review of the two-mentioned databases, and a call to the Federal Government to update the DOT.

Vocational rehabilitation counselors, case managers and vocational experts rely on the *Dictionary of Occupational Titles* (DOT, 1991) and its companion publication the *Selected Characteristics of Occupations Defined in the Revised Dictionary of Occupational Titles* (SCO, 1993) to augment their casework, both for case management and forensic purposes. As the DOT has not been updated since 1991, its utility as an occupational classification system in today's complex world of work is problematic. The United States Department of Labor (DOL) abandoned the DOT and instead developed O*NET, the *Occupational Information Network*. Many users of the DOT, including the Social Security Administration (SSA), have determined that O*NET does not meet its needs.

In the spring of 2007, the International Association of Rehabilitation Professionals (IARP) Board of Directors approved the formation of the IARP Occupational Database Committee (IODC) to conduct research to evaluate whether an occupational database existed that might be considered an acceptable interim or permanent replacement for the *Dictionary of Occupational Titles* (DOT). The scope of the project was multifold: to become familiar with past efforts at revising or replacing the *DOT;* become familiar with the current uses of the *DOT* and *O*NET;* identify other occupational databases; evaluate validity and reliability issues concerning the *DOT*, *O*NET* and other occupational databases; and to develop grass-roots support for the revision or replacement of the DOT. The IODC also sought to work with all stakeholders to approach and work with the SSA and the DOL to develop an agreeable solution to the identified problems.

IARP was previously involved in establishing the Inter-Organizational Task Force (IOTF) on O*NET, which worked diligently with concerned stakeholders, and the DOL and SSA in attempts to make O*NET functional for vocational purposes and/or to update the DOT. "The goal of the IOTF is to assist DOL and SSA to establish a common, objective, measurable, and reliable framework that can best describe the physical, mental, cognitive, training and environmental demands associated with occupations" (Truthan & Karman, 2003, p.21). The IOTF was successful in establishing clear reasons why O*NET as designed did not meet the needs of the disability, rehabilitation, and adjudication community. The IOTF proposed new methods of data collection and demonstrated the efficacy of Internet-based training in job analysis techniques. The IOTF effort stalled several years ago when a Request for Proposal to update the DOT languished at SSA/DOL.

Summary

The DOT was first developed in the 1930s and currently contains 12,761 job descriptions or definitions in a narrative, highly structured fixed format. Data collected for the *DOT* describes skills, knowledge, temperaments, physical capacities, environmental working conditions, abilities, and traits workers need as well as the education and training requirements, machines, tools, equipment and materials used and the products produced. The first edition was published by the DOL in 1939. Beginning in 1944, the DOL published a protocol for analyzing jobs that provided extensive details on what traits to observe and how to rate them (Weed, 2002). The most recent version of this procedure is presented in detail within *The Revised Handbook for Analyzing Jobs* (1991).

The Social Security Administration (SSA) identifies the *DOT* as a primary source of occupational information used to determine disability benefits. Vocational rehabilitation practitioners utilize the *DOT* extensively to identify potential new occupations for persons with disabilities and for job analysis (Blackwell et al., 1992; Field & Field, 2004; Weed & Field, 2001). The *DOT* is also central to guidance and counseling professionals in high schools and beyond, where it is used to identify transferable skills to plan career options (APDOT, 1993). It is used to assess work history, determine vocational disability outside of SSA, and to conduct research into the world of work (Botterbusch, 1993).

The DOL has not formally updated the *DOT* since 1991. Instead, the DOL developed an entirely new system, the *Occupational Information Network (O*NET)*. The first O*NET database was released in December of 1998. The 12,000+ unique occupational descriptions of the *DOT* were compressed to about 1,100 occupations in this first version of *O*NET*. Subsequent releases of the O*NET database further condensed the number of unique occupations to about 800 occupations. There has been some discussion about expanding this number by about 100 occupations. DOT variables typically relied upon by vocational rehabilitation practitioners to analyze jobs, to assess transferability of skills, and to identify potential new occupations for persons with disabilities have been modified extensively with the development of the *O*NET*. It took the DOL 10 years from this first release to gather a sufficient quantity of incumbent responses to provide more updated information about these 800 occupations.

Prior to the development of O*NET, the Advisory panel for the *Dictionary of Occupational Titles* (APDOT, 1993) had recommended specific goals for replacing the DOT. SSA has determined that the O*NET does not meet these goals. In fact, the Department of Labor states: "the O*NET database was not designed, nor is it supposed to be used, as a job selection or matching tool" (Wagner and Harvey, 2005).

A History of the DOT

Following the Civil War, the United States began to classify occupations as a method to assist in the transition from a war to a non-war economy. The U.S. Census began classifying occupations at this time as well. Rapid industrialization created all types of new occupations for which new and specialized skills were needed. Industrial engineering studied production tasks in minute detail to determine the most efficient performance methods. Methods-Time-Measurement principles evolved to feed the age of mass production. Employment, intelligence, and aptitude testing emerged to place personnel into tasks for which they were suited. Massive military manpower needs further demonstrated the importance of properly identifying the right people for the right jobs in both World Wars.

Great Britain's Ministry of Labor authored the first occupational classification handbook in 1927: *A Dictionary of Occupational Terms*. In 1933 the Wagner Peyser Act established the United States Employment Service (USES) to assist in matching workers with jobs. At about the same time, significant occupational research began, leading to the publication of the first edition of the *Dictionary of Occupational Titles* in 1939. Prior to this there was no common language regarding jobs and work (Fine, 2004; Miller et al., 1980; National Research Council, 1999).

Subsequent editions of the DOT were published in 1949, 1965, and 1977. The 1st Edition contained 17,500 job titles with 550 occupational groups. The 2nd Edition (1949) reflected changes to the economy as a result of World War II. Designations of jobs as "skilled, semi-skilled or unskilled" were eliminated from the 3rd Edition (1965). This edition included additional classifications on training time, aptitudes, interests, temperaments, physical demands, working conditions, work performed and industry. All occupations were tied into the data-people-things construct, the foundation of functional job analysis developed by Sidney Fine in the 1950s. For the 4th edition of the DOT (1977), more than 75,000 job analyses were conducted (although this number may be inflated). Several thousand definitions were updated and more than 2,100 definitions were added. Subsequent to this, supplements were released in 1982, 1986 and 1991. The 1986 supplement added 761 job titles. The 1991 supplement included 844 new titles, deleted 208 jobs, and gave information for each title on: GOE code, strength factor code, GED codes (reading, math and language), SVP, and date of last update for each definition. In a 1998 memorandum, 20 jobs were added to the DOT.

The National Research Council (1999) defined occupational [job] analysis as follows: "the tools and methods used to describe and label work, positions, jobs and occupations" (p. 1). The DOT (1991) defined an occupation as: "a collective description of individual jobs performed, with minor variations, in many establishments" (p. xvii). A product of occupational analysis is occupational classification or occupational structure. "Occupational structures reflect the nature of work, its organization, employment relationships, demographics, and other factors. Occupational Structures serve a defining function that tends to be backward-looking, reflecting what existed in the past, rather than forward-looking, reflecting trends in the changing organization of work" (p.1). The DOT classified occupations by Occupational Group Arrangement (the first three digits) by work performed, such as "professional, technical and managerial." The next three digits addressed the complexity of the job (data-people-things), and the last three represent a unique numerical identification number for each job (US Department of Labor, 1991). Fine (1968) noted that there are actually four classification systems within the DOT: classification by job content; by worker function; the industry affiliation; and alphabetically by title. Basic concepts described in the DOT include element, task, position, job, and occupation. Each occupation is broken down by occupational code, title, industry designation, alternate titles, body of definition, undefined related titles, and definition trailer.

There are three elements of work: what the worker does (classified as data, people, things); what gets done (work fields); and the end product (materials, products, subject matter and services). Worker functions were added to the DOT in 1965. There are a total of 23 worker functions within data-people-things. Fine (1968) said the "significance of this small number of worker functions is that they represent the entire range of function in jobs throughout the occupational spectrum" (p. 374). Work fields are felt to be important because skills will transfer best to environments that are similar to the ones in which the employee has worked previously (Dunn & Growick, 2000; Fine, 1957a). Having precise language with which occupations can be defined allowed the DOT to become "a more precise instrument for analyzing job content" (Fine, 1957b, 940).

The *Selected Characteristics of Occupations Defined in the Revised Dictionary of Occupational Titles* (1993) provided supplemental data on occupations included in the DOT. It included DOT titles arranged by *Guide for Occupational Exploration* group, SVP, strength level and environmental conditions; an index of titles with DOT codes; and definitions of the worker traits SVP, physical demands, environmental conditions and worker functions. The first edition was published in 1966, with updates in 1968, 1981, and 1993. It was validated through a study of 266 jobs in the clock and watch industry. The study compared field job analyst ratings with those made by analysts working off of job descriptions.

Miller et al. (1980) conducted a survey of DOT purchasers. At that time, 88% of purchasers reported that if the DOT were discontinued their work would be disrupted, while 36% reported that such a discontinuation would lead to a serious disruption in their work. They found that purchasers of the DOT were a diverse group, including government agencies such as Immigration, Bureau of Labor Statistics, Bureau of Apprenticeships and Training, the Social Security Administration, Department of Defense, state Labor Market Information departments, et cetera; private for profit companies; nonprofit agencies; rehabilitation and employment counselors; researchers; and educational institutions. The primary use reported by purchasers was for career and vocational counseling. Other uses included library reference, rehabilitation counseling, personnel management, and employee placement. They found that the DOT was frequently used by social science researchers, identifying 150 research articles that either commented on the DOT or used DOT data during the period of 1965 to 1980.

Job Analysis

The basis for the DOT is job analysis. *The Handbook for Analyzing Jobs* (HAJ, 1977) and *Revised Handbook for Analyzing Jobs* (RHAJ, 1991) were the job analysis methodologies used to develop the DOT. The original *Handbook for Analyzing Jobs* was developed in 1944. According to the RHAJ, job analysis is a systematic study of a specific job in terms of: the worker's relationship to data, people, and things; methodologies and techniques employed; machines tools, equipment and work aids used; materials, products, subject matter, or services which result; and worker attributes that contribute to successful job performance. Job analyses are basic for supplying the occupational information needed for vocational counseling and various human resource functions. Following this protocol allows the vocational counselor to assess the tasks and requirements of jobs, training, and experiences that lead to them.

While there is much written in the industrial/organizational psychology literature about job analysis, there is little agreement as to what constitutes a job analysis. This is a problem for occupational analysis. There is also disagreement whether incumbents, supervisors, experienced raters or subject matter experts should be conducting job analyses. Gibson (2001) cites numerous studies that support each option. After a review of the research however, Gibson supports job analyses conducted by experts, as do Weed and Field (2001). A third issue is accuracy of job analysis data (Morgeson & Campion, 2000). Accuracy

of the job analysis data is critical to legal defensibility (Harvey & Wilson, 2000). These issues would need to be resolved in order to develop a new occupational classification system or to update the DOT.

There are two primary formats in job analysis: work-oriented and worker-oriented. A work-oriented job analysis speaks to what gets done, whereas a worker-oriented analysis focuses on what the worker does (McCormick et al., 1972). The DOT is actually a hybrid, using both formats.

There are numerous job analysis methodologies. Some of the more well-known job analysis methodologies include the Position Analysis Questionnaire (PAQ, 1972), the Fleishman Job Analysis Survey (F-JAS, 1975), the Job Element Inventory (JEI, 1978), the Occupation Analysis Inventory (OAI, 1983), and the Common Metric Questionnaire (CMQ, 1989). All of these formats are descriptive in nature. There are other categorical types of occupational classification systems, such as the Standard Occupational Classification (SOC), the Classification Index of Occupations in Industries (based on the Current Population Survey), and the International Standard Classification of Occupations. The DOT combines descriptive and categorical systems, as does O*NET.

The PAQ is a well-researched worker-oriented job analysis methodology. There are 187 items within six dimensions rated in the PAQ: information input, work output, mental processes, relationships with others, job context, and other work characteristics (McCormick et al., 1972). The PAQ has an estimated reading level at the post-college-graduate level (Disability Research Institute, 2002; Harvey, 1993; National Research Council, 1999). This makes it difficult for incumbents to complete. Another criticism is the extensive amount of time required pre-and post-interview (Disability Research Institute, 2002).

The CMQ requires an eighth grade reading level on the part of the rater. It can be completed by the incumbent. It measures observables (behaviors), not the knowledge, skills, and abilities needed for jobs. It is usable for both blue and white collar jobs. There are over 2000 items to be rated over 80 work dimensions (Disability Research Institute, 2002; Harvey, 1993; National Research Council, 1999). Reliabilities fall at about .86 (Gibson, 2001). Harvey (1993) developed the CMQ in response to limitations ascribed to existing job analysis methodologies. He reported two main areas of limitation in the DOT: lack of a common set of "general work behaviors" and issues with the rating scales used in the instruments. Although Harvey developed the CMQ, in a 2004 article by Fine et al., he reached agreement with Fine that functional job analysis, focusing on what the worker does rather than on what gets done, would be preferred for the development of a taxonomy of general work activity that

would include data-people-things and the functional job analysis approach developed by Fine.

The JEI was developed for use when completing a PAQ is not feasible. It has 153 items with only one rating scale — relative time spent. Required reading level is at about the 10th grade so it can be completed by many job incumbents. It measures jobs in terms of abilities required. Of the items to be rated, there are 21 cognitive abilities, 10 psychomotor abilities, nine physical abilities, and 12 sensory abilities. Reliabilities are reportedly between .66 - .90 (Disability Research Institute, 2002; National Research Council, 1999). Harvey et al. (1988) found the factors in the JEI paralleled those of the PAQ. Criticisms with this instrument as well as the PAQ are that they require raters to infer human characteristics to jobs (Disability Research Institute, 2002; Harvey, 1993; National Research Council, 1999).

The F-JAS is based on 52 items assessing physical, sensory, psychomotor, cognitive and interpersonal abilities including knowledge and job skills. It can be completed by incumbents. Studies have shown reasonable reliability and validity attributed to the F-JAS instrumentation and methodology (Disability Research Institute, 2002; Harvey, 1993; National Research Council, 1999). The O*NET is based on this method.

The OAI has 602 items for 102 human attributes, in the categories of information received, mental activities, work behavior, work goals, and work context. It is geared primarily for education and guidance. Reliabilities on the OAI are lower than those of the PAQ. The OAI is geared for use by someone with a college-level reading ability and training in the use of the instrument.

O*NET is a worker-oriented job analysis database. It was developed to replace the DOT. It builds on the foundation developed by the F-JAS. O*NET includes six domains: worker characteristics, worker requirements, experience requirements, occupational requirements, occupation-specific requirements, and occupational characteristics. Items measured include basic and cross-functional skills, knowledge, occupational preparation, generalized work activities, work context, organizational context, abilities, occupational interests and values. Reliability and validity studies are ongoing.

A relatively new extension of job analysis is cognitive task analysis (CTA). "Cognitive task analysis is the extension of traditional task analysis techniques to yield information about the knowledge, thought processes and goal structures that underlie observable task performance" (NATO Research and Technical Organization, 2000, p.iii). Occupations today rely more on cognitive abilities, yet these are not captured in the DOT. Cognitive task analysis is very time con-

suming, and may not be necessary or valuable for many jobs (Reynolds & Brannick, 2002).

Steel et al. (2006) report on recent research showing that a majority of jobs can be described by relatively few factors referred to as "general work activities" (GWA) or "general work behaviors." They define general work behaviors as "behavior descriptors that are applicable across a wide range of occupations such as 'coaching and developing others'" (p. 21). Steel et al. conducted research showing that the 52 ability factors in O*NET can be reduced to five factors: physical, cognitive, sensory and perceptual, psychomotor, and interpersonal. These factors are the same ones developed by Fleishman and used in the F-JAS. Another study reduced the 52 factors to 12, while a third study took 65 ability factors and reduced them to seven. Harvey (2004) advocates for the development of a taxonomy of general work activities to show variability in jobs just as there are constructs to demonstrate individual differences. "When dealing with workers with injuries or disabilities, practitioners must be able to accurately assess which GWAs can — and cannot — be performed in order to determine whether workers can return to their former occupations. . . ." (p.2).

The Social Security Job Demands Project (2002), which was conducted by the Disability Research Institute at the University of Illinois at Champaign-Urbana, reviewed many job analysis methodologies and concluded that an agreement must be reached on what constitutes a job demand and then utilize this to develop a new job analysis methodology.

Development of the DOT

Miller et al. (1980) discussed the methodology used to produce the fourth edition of the DOT in 1977. The sample for the DOT included all jobs in the United States economy. Jobs were categorized by industry and then industries were assigned to different field offices. On average, each field office was responsible for 42 industries, although the workload was not evenly distributed. The "any industry" designation was given to one field office. Because the majority of the DOT's industry designations are industrial, the majority of the information gathered for the fourth edition was in manufacturing. In comparison, the *Standard Industrial Classification* manual at that time had less than half of its industry designations in manufacturing.

Miller et al. (1980) were unable to determine the basis for assignment of industries to field offices, except that some of this was done by common sense; for example, the Texas office would not handle the logging industry as it did not exist in their locality. The *Handbook for Analyzing Jobs* (HAJ) was utilized as the job search methodology. The HAJ, however, provided little guidance on how to study an industry (Miller et al., 1980).

There was no clear supervision of analysts and of the sampling plan by the national office, according to Miller et al (1980). It appeared that the primary criteria used by analysts to choose which establishments to analyze had to do with proximity to the field center office. Some analysts stayed within their own state, while others stayed within their own metropolitan area. County Business Patterns (produced by the U.S. Census Bureau) was used to determine the number of establishments. At that time, County Business Patterns covered about 90% of all US businesses and 75% of all employed persons. It did not include some agricultural and farming jobs, domestic workers, the self-employed, railroad workers, and some government employees. It is important to note that part-time and trainee positions were excluded. The plan called for choosing one small, one medium, and one large establishment within each industry. Analysts also tried to reach new and emerging technology companies. There was no mechanism to encourage employers to participate in the project; therefore some of the employers contacted did not participate. When analysts were allowed into establishments, they had to negotiate with the employer regarding which jobs would be analyzed. Sometimes employers and/or unions were highly suspicious about the intent of this supposedly benign government-initiated investigation of current work practices.

When determining which jobs to analyze, analysts would first identify whether the jobs matched any jobs from the third edition of the DOT (Miller et al., 1980). If there was a match, they may or may not have performed a job analysis. Some of the analyses completed were abbreviated job analyses. If it was known that another analyst had completed a review of that particular job, it would not be reanalyzed. They would not analyze jobs within an establishment that fit within "any industry" like clerical jobs in a manufacturing setting, rather they would focus on jobs that appeared unique to that establishment. Employers would typically steer analysts toward their top performers, rather than allowing analysts to see what the performance of an average worker might be. Analysts would typically observe one to two workers per job. Based on this sampling methodology, Miller et al. (1980) determined that it was impossible to identify whether the DOT was indeed representative of all jobs in the United States economy. They also had questions about the ability to achieve a representative sample under any circumstances.

There was no standard form which analysts used to record data from their observations or interviews. An analyst may use the HAJ form, use another format, or simply make notes. Instructions on rating some of the worker traits were vague, particularly aptitudes, temperaments, and interests (Miller et al., 1980). When analysts were asked how they determined ratings, they were generally unable to provide a concrete ex-

planation beyond subjective means or experience. Much of the time, analysts were not allowed to bring in tools to measure various elements of jobs, therefore physical demands were primarily rated by observation alone.

Once the analyst had gathered the necessary data from an establishment, he or she would complete the job analysis schedule from the HAJ back in the office. Not all analysts, however, completed job analysis schedules. Miller et al. (1980) reported that schedules were available for only two thirds of the occupations. Once the job analysis schedules were completed, the schedule was typically reviewed by a lead analyst or supervisor. These reviewers were not required to be knowledgeable about the jobs they were reviewing. The reviewer was allowed to change definitions. A study conducted in 1979 analyzed 307 random DOT titles and found that 81% of them were exactly the same as the third edition. When compiling information from a variety of job analyses on the same occupation, analysts used the mode for each point of data rather than the mean. Thus, if the majority of job analyses for a secretary rated the job as sedentary, the occupation would have a rating of sedentary. If calculated from the mean, the occupation could be rated as light even though the majority rated it as sedentary.

Substantially more information was collected during the establishment visits than was published in either the DOT or the SCO. Data such as level of education and experience required per job, any licenses or certificates needed, promotional or transfer opportunities, and more detailed description of job tasks was collected. This information was not published anywhere (Miller et al. 1980).

Because of a time crunch to complete the fourth edition, analysts were directed during 1974 through 1976 to focus on comparing jobs to those that had been analyzed in the past. Next they were asked to focus on jobs not available for job analysis in the third edition. These two things together led to decreased quality of the project but an increased number of jobs analyzed. It is important to note that 30% of the job analyses for the fourth edition were completed during this period. When analysts would encounter a job that was diffi-

cult to analyze, they would typically contact trade and professional associations, industry representatives, or employers to obtain a verbal analysis.

Table 1 identifies the dates of last update for all DOT titles. Over 80% of the DOT titles were last reviewed over 30 years ago.

Miller et al. (1980) reached the following conclusions after reviewing the production methods of the fourth edition of the DOT: analysts were given inadequate and insufficient instruction in how to study industries and jobs: the HAJ was not produced until 1972, during the development of the fourth edition and thus there were no clear methods for data collection prior to its publication; work procedures were not well documented and there was no clear decision-making process; there was no attempt to develop a new job analysis method that would coincide with changes in the world of work; and since much of the time was spent verifying third edition occupations, they questioned whether efforts were made to adequately cover new and emerging occupations.

Use of the DOT in Rehabilitation

As a regular part of their occupation, rehabilitation consultants evaluate the work histories of their clients and conduct on-site job analyses to identify the requirements of jobs. In doing so, case managers, vocational rehabilitation consultants, and vocational experts utilize and rely on the DOT as the basis for transferable skills analysis and job analysis (Blackwell et al., 1992; Botterbusch, 1993; Darling et al., (2002); Field, 1999; Field & Field, 2004; Field & Weed, 2001; Field et al., 2006; Harper, 1985; Havranek et al., 2005).

"Much of vocational counseling and vocational evaluation focus on determining the consumer's worker characteristics and relating these characteristics to the worker characteristics demanded by specific jobs or occupational groups. Without both job and worker codes, the process would not be very precise and would have to rely much more on the subjective impression of the V[ocational] C[ounselor]" (Botterbusch, 1993, p.102).

Table 1. Dates of Last Update, DOT

Date last analyzed	N	% titles	Age
1977 and previous	10,288	80.6	30 years
1978	355	2.8	30 years
1979-1982	520	4.1	>25 years
1984-1988	1,187	9.3	>20 years
1989-1991	390	3.1	>15 years
1993	20	0.2	15 years

Dunn and Growick (2000) wrote about the importance of occupational data in rehabilitation, particularly the DOT:

> *"An understanding of the dimensions of occupations which individuals have performed in the past provides important estimates of worker capabilities and the situations in which the worker has used them. . . . [the] DOT and associated publications provide the standardized and accepted means by which the workers employment history may be dissected in two dimensions which may be compared to and contrasted with other occupations" (p. 80).*

The DOT provides a framework for occupational classification. It allows individuals to identify a worker's past occupational history and the worker traits associated with these jobs so that the information may be compared to the worker's residual functional capacity, identifying which skills may transfer to other occupations (Bast et al., 2002; Dunn & Kontosh, 2002; Rubin & Roessler, 1983; Weed & Field, 2001). This is transferable skills analysis.

Transferable Skills Analysis

The concept of transferable skills analysis (TSA) is instrumental in determining loss of earning capacity in a forensic setting. Fine (1957 II) defines transferability of skills as "the continuous use of acquired knowledge and abilities when moving from one job to another." Deneen & Hesselund's (1986) definition of transferable skills "are those behaviors which can be measured and used at will that are applicable to different situations and/or various job duties and for which an employer will pay" (p.57). And they write that "the concept and above definition of marketable transferable skills should be at the heart of vocational counseling and job placement services" (p.57).

The U.S. Code of Federal Regulations (20 CFR 404.1568(d)) defines transferable work skills as:

> *"What we mean by transferable skills. We consider you to have skills that can be used in other jobs, when the skilled or semi-skilled work activities you did in past work can be used to meet the requirements of skilled or semi-skilled work activities of other jobs or kinds of work. This depends largely on the similarity of occupationally significant work activities among different jobs."*

Transferability of skills has value any time an individual needs to change jobs or employers (Field et al., 2006). "Skill is regarded as a national resource as valuable as our national resources" (Fine, 1957a, p. 804). When a worker takes a job that does not utilize his or her transferable skills, Fine believes this national resource is wasted.

Significant factors in completing a transferable skills analysis include work fields (WF), materials, prod-

ucts, subject matter and services (MPSMS), and specific vocational preparation (SVP) (Bast et al., 2002; Botterbusch, 1993; Williams, 1998) and also the data, people, thing (DPT) taxonomy developed by Fine in 1957 (Kontosh & Wheaton (2003). The classic method of transferable skills analysis has been used by the Social Security Administration and vocational consultants for decades (Bast et al., 2002). Weed and Field (2001) note that the Social Security model of transferable skills analysis is the benchmark. The Social Security Administration declared the DOT an authoritative reference in 1978 (Truthan & Karman, 2003). In fact, due to the opinion handed down by the court in Haddock v. Apfel (196 F3d 1084, 10th Circuit, 1999) SSA issued *Policy Interpretation Ruling SSA 00-4p: Titles II and XVI: Use of Vocational Expert and Vocational Specialist Evidence, and Other Reliable Occupational Information In Disability Decisions* (December 2000) which requires VEs to give a reasonable explanation if there is any conflict between their own testimony and the DOT. Despite SSA's position, the Department of Labor considers the DOT to be obsolete, thus Field cautions against its use (Field, 2002).

Matching residual worker abilities and skills to the requirements of jobs, as is done in a TSA, helps to insure a successful return to work. A worker is said to have a positive work adjustment when he or she is satisfied with the current job and the recognition received for work done, and is able to meet the requirements of the job (satisfactoriness). When both satisfaction and satisfactoriness are high, a worker will have longer tenure on the job (Dawis et al., 1964).

In determining a person's employability, vocational consultants utilize a return to work hierarchy. This hierarchy is: return to work same employer same job; return to work same employer different job; return to work similar job different employer; and return to work different job, different employer (Dunn, 2000; Dunn & Kontosh, 2002; Matkin, 1985; Welch, 1979). In this way, jobs that are most closely related to past work are considered first, using familiar work fields and materials, products, subject matter and services. "This not only is considered beneficial to increasing the speed of job placement and claim resolution, but also conforms to many of the vocational theories upon which vocational rehabilitation practices are based" (Dunn, 2000). The basic hierarchy is found in transferable skills processes such as Vocational Disability and Residual Employability (VDARE) by McCroskey, Wattenbarger, Field and Sink (1977) and various software programs.

With aging DOT data and the inability to use O*NET for transferable skills analysis, rehabilitation consultants face a dilemma: what resources should be used and relied upon? "The dilemma for most vocational experts, dealing with both the Social Security disability program and civil court tort cases, is a choice between

using a source of significantly outdated information (the DOT), or using its incomplete and incompatible replacement" (Stein, 2002).

Replacing the DOT: Issues and Options

A primary mission of the IODC committee was to examine a variety of DOT alternatives. Several efforts were reviewed by the committee.

DOT Issues

A seminal review of the DOT was conducted by Miller et al. (1980) on behalf of the National Research Council. In their study they visited 7 of the 11 field offices and reviewed thousands of records. The primary responsibility of the field centers was to provide raw data for the DOT. However, analysts were spread thin and asked to complete other tasks such as the development of career brochures. Miller et al. (1980) found a lack of documented procedures for most parts of DOT development. This complicated their research. Through this review they noted many faults with the DOT but also found that as it was the best source for occupational information that people continue to use it until it could be replaced.

"The comprehensiveness, reliability and accuracy of the DOT are in large part a function of the data collection and analysis procedures used to produce it" (Miller et al., 1980, p. 114). Because written procedures were lacking, researchers had to interview staff in order to learn how the DOT was produced, start to finish. The major principles of the DOT were established in 1939 and 1945. The same basic methodology was used in 1965 and 1977. There was no accounting for changes in the world of work during of those intervening years.

Miller et al. (1980) found the DOT sampling plan (for the fourth edition) to be "complicated and indirect" (p. 8). Although the sampling pool consisted of all jobs in the United States, coverage was very uneven. Different industries were assigned to different field offices. At that point, each field office would choose which establishments they would analyze, trying to pick "typical" establishments. If an establishment chose not to cooperate, there was no recourse. Next, the field analyst would select jobs at an establishment via a negotiation process with each establishment. Again, the establishment could decline the analysts request to analyze certain jobs.

Miller et al. (1980) studied a sample of 1,950 establishments from the fourth edition. Of this sample, 67% of the establishments were in the manufacturing industry although at that time, manufacturing accounted for only 8% of all establishments and 32% of all employees. Retail trade had a 4% representation in the fourth edition DOT when in actuality it accounted

for 29% of the establishments and 20% of employment. Similarly, services accounted for 7% of the DOT while it actually represented 27% of establishments in 20% of employment. In 1977 establishments employing one to four workers made up 59% of all establishments, but represented only 6% of the DOT. Miller et al. (1980) found that employers with less than 20 employees were underrepresented while those with over 20 employees were over-represented.

They reported that in the fourth edition, some occupations were not reviewed at all, whereas others may have been reviewed an unreasonable number of times, such as material handler, which had 652 individual job analyses. Miller et al. (1980) reported the following: 16% of the occupational descriptions were completed without a single job analysis; 29% were based on one job analysis; 19% were based on two job analyses. Thus two thirds of the fourth edition of the DOT was based on less than three job analyses per job. Only 36% were based on three or more job analyses. Miller et al. also reported problems with quality of the source data, indicating that three fourths of the job analyses used in compiling the fourth edition "do not meet the standards specified for a complete job analysis" (p. 10).

There are a number of concerns/issues with DOT data. For one, the DOT is based primarily on a manufacturing economy rather than the service-based economy that is now the reality. With the changing nature of work, jobs have become more cognitive in nature and less physical. Jobs today involve more use of technology. Occupational boundaries have become fuzzy, and cross-functional teams are used everywhere. This type of information is lacking in the DOT. The RHAJ does not provide an adequate format for addressing cognitive tasks. Additionally, the RHAJ has not been updated since 1991.

Cain et al. (1983) conducted research on the reliabilities of certain ratings in the DOT. Their research utilized job descriptions in manufacturing and service related occupations that had already been prepared in a job analysis. Using two job descriptions for each of the 24 occupations, the authors had experienced field analysts from across the country rate these job descriptions and then compared the results. They found reliabilities (which are most equivalent to test-retest reliability) to be acceptable for the following factors: data, people, GED reasoning, GED language, and specific vocational preparation. Reliabilities were modest for things, GED math, strength factors, and location. The authors indicated that it was their expectation that strength and location reliabilities would increase if the job had been directly observed. The reliabilities were also higher for manufacturing jobs than they were for service sector positions. The authors surmise that this may be the case because at that time,

analysts were most experienced with rating manufacturing jobs.

Harvey reported (in Fine et al. 2004) several studies that point out the limitations of the DOT, with particular attention to the legal and psychometric defensibility when single item holistic scales were used to rate worker-trait factors. O*NET uses holistic rating scales as well. Holistic ratings may show low inter-rater reliability as well as low discriminant validity. Another problem is the lack of frequent updates — over 10 years between updates.

Dunn & Growick (2000) addressed problems with the DOT such as: no consideration of central aspects of occupations such as organizational setting and responsibility level of the worker; low reliability of worker traits; a redundant classification system; skills that are psychometrically questionable, particularly GED and SVP; and ambiguous definitions of worker traits, with questionable validity of such traits.

The National Research Council (1999) identified primary weaknesses of the DOT. One weakness being the "unwieldy size and growing disparity between definitions in the real world of work" (p.7). Second, because of the high level of detail in each description, it is difficult to make comparisons from one occupation to another. Third, jobs are described by task and lack information on other factors such as skills, abilities, and knowledge requirements that are either not collected or not reported. Fourth, there is no little or no reported information on cognitive factors. Because of its size, it is quite expensive to update and therefore much of it remains out of date. And sixth, job descriptions in the DOT make it difficult to link to other databases.

DOT Reliability and Validity

Problems were identified with worker characteristics (Miller et al., 1980). As the characteristics were developed in the 1950s, their applicability and validity for a more contemporary labor market was questioned. The measurements of worker characteristics were found to be fairly unreliable. Some were shown to have moderate reliability, where others were shown to have very poor reliability. A factor analytic study of these characteristics was conducted and revealed that six factors accounted for 95% of the common variance. Therefore, Miller et al. recommended a complete and thorough review of worker traits and functions to determine the characteristics that need to be measured and then to determine how best to obtain the information. They also recommended identifying "interchangeable jobs" which would include jobs that a person is matched for and jobs the person could adequately perform based on their ability to perform the original job. An example may include a ticket taker at various establishments or a dispatcher in different industries.

During Miller et al.'s (1980) visit to the field centers they identified a lack of control over data collection activities at the field centers. Not all of the job analyses have been completed and the quality varied greatly from analysis to analysis. There could be several reasons for this, one being that field centers were under state control rather than federal control. Analysts and staff were actually employed by each state. This could have led to poor communication and control. Additionally, states required different qualifications for the position of a job analyst; it could be an entry-level position in one state as compared to a senior level position in another. The job analyses for the 1977 edition were completed between 1965 and 1976, an 11 year period. All of the occupational definitions, however, were not written until 1976, and even then, the individuals who wrote the definitions were not necessarily the ones who analyzed the job.

Analysts used a variety of sources of information to write the definitions not solely the job analyses themselves. If a definition writer thought that the ratings on a job analysis were in error he or she had the ability to change the ratings. There was no set criteria for doing this or for combining jobs into one occupation. Miller et al. (1980) found the review process to monitor the writing of definitions to be inadequate.

Miller et al. (1980) reported on a 1979 study of the national field offices, which condemned the management, the structure of the organization, and the size of the task. That study concluded the field offices did not have the resources to complete the job since publication of the third edition. Miller agreed with this study, indicating that these factors lead to "weakening quality of the DOT" (p. 113).

The structure of the DOT doesn't work well with career planning, with the exception of Occupational Group Arrangements and its use of listing occupations in a hierarchy by data-people-things codes. Botterbusch (1993) also commented on the long-held assumption that data-people-things itself is hierarchical – data is hierarchical, whereas people is not and things is actually two tiers. While one may think that GED is related directly to a person's education, it is not. And SVP doesn't tell one whether education is formal or on-the-job. Botterbusch also reports on the difficulty in defining, using and defending temperaments. He recommends that the number of titles in the DOT be reduced as it is too specific.

O*NET: Basis and Issues

O*NET is the Department of Labor's replacement for the DOT. O*NET is a skills-based database rather than a task-based dictionary as is the DOT. A preliminary version of O*NET was released in December of 1997, with O*NET 98 released to the general public in December of 1998. Rather than using the nine digit

DOT code, O*NET coding aligns with the *Standard Occupational Classification System* (SOC). At present, in O*NET version 13, there are 812 occupations compared to the 12,761 in the DOT. The database was initially populated by experts; howeve,r surveys are now completed by incumbents. Experts continue to rate areas such as abilities. O*NET has 277 descriptors covering six domains (Mariani, 1999; O*NET Online).

Occupational information in O*NET is composite information from many jobs and therefore is not intended to describe a particular job (O*NETcenter. org). Many DOT titles were aggregated to create occupational units (OU), which led to an averaging of the occupational titles contributing to the OU (Disability Research Institute, 2002; Gustafson & Rose, 2003). While aggregating the data, information specific to certain jobs has been lost (Disability Research Institute, 2002). In the DOT, some jobs may have been classified as sedentary or light, while in O*NET the occupational unit may include jobs that are sedentary all the way up to heavy in the same grouping. The same holds for other worker traits. Additionally, the mean was used to calculate ratings rather than the mode used in the DOT.

Scales in O*NET are quite different than the DOT. For example, the strength ratings found in the DOT (sedentary, light, medium, heavy and very heavy), are now described in O*NET by a variety of physical requirements, including gross body coordination, dynamic strength, and static strength. The Specific Vocational Preparation (SVP, levels 1-9) ratings within the DOT, designed to measure the amount of time required by a typical worker to learn techniques, acquire information and develop abilities needed to perform in a specific work situation, have been sorted by O*NET into five Job Zones. Job Zones are more abstract and include: little or no preparation needed; some preparation needed; medium needed; considerable preparation needed; and extensive preparation needed as opposed to amount of time needed.

O*NET does not provide enough of or the right kind of information regarding physical demands, training requirements, and other elements essential to transferable skills analysis (Dunn & Kontosh, 2002; Fine, Harvey & Crenshaw, 2004; Truthan & Karman, 2003). "In particular, O*NET as currently implemented arguably fails to provide (a) occupational data expressed at the appropriate level of *detail* and *defensibility* needed for many functions and (b) and occupational title taxonomy that is sufficiently *detailed* and phrased at the desired level of analysis"(Fine, Harvey & Crenshaw, 2004, p.1). Its terminology and measurement scales are poorly defined. It continues to fail to meet the needs of many users, including forensic vocational experts, rehabilitation providers and particularly the Social Security Admin-

istration (IARP, 2001; Karman, 2002; Wagner and Harvey, 2005). For these reasons, the Social Security Administration has continued to rely on the DOT in its disability determination process.

There are also concerns with definitions and measurement of job demands in O*NET. Many job demands are difficult to measure, due to the inability to observe the demands (such as cognitive elements), and the use of numerical scales over interval scales (Disability Research Institute, 2002; Gustafson and Rose, 2003).

O*NET is completed by incumbents, with the exception of the Abilities ratings (Willison et al.). The literature reports numerous concerns about the reliability of self-ratings/self-preservation (Morgeson & Campion, 1997). This is also a concern with occupational data provided by incumbents. Incumbents tend to inflate ratings to look more favorable (Harvey, 2005; Morgeson, Delaney-Klinger, Mayfield, Ferrara & Campion, 2004; Stetz, Beaubien, Kenney, & Lyons, 2008). "For over 50 years, research has shown that different sources of job/occupational analysis ratings (e.g., incumbent versus supervisors) often disagree significantly. . . " (Harvey, 2005). Also with incumbent ratings comes the problem of incomplete survey instruments.

There are five separate O*NET incumbent surveys. The generalized work activities questionnaire is 25 pages long, includes 41 areas with questions under each area. The other questionnaires are shorter: 19 pages for the skills questionnaire; 18 pages for the knowledge questionnaire; five pages for work styles; and three pages for education and training.

McDOT & IODC Evaluation

The McCroskey Dictionary of Occupational Titles (McDOT) is part of the McCroskey Vocational Quotient System, which is utilized in completing transferable skills analyses. McDOT is currently in its seventh edition.

McCroskey et al. (1977) developed the Vocational Diagnosis and Assessment of Residual Employability (VDARE), which was one of the first systematic approaches to manual completion of a transferable skills analysis. Reliability measures for the VDARE have ranged from 0.9864-0.9944 (Dennis & Dennis, 1998). It has been found to be predictive of employability. Most transferable skills analysis software is based on VDARE (Sleister, 2002).

McDOT was developed to replace the 1991 version of the DOT. In McDOT, McCroskey used what Stein (2002) refers to as "advanced statistical processes" to update the DOT by including data from O*NET. McCroskey then "fused" worker traits from the DOT with trait elements from O*NET to arrive at 24 most significant worker traits. A worker trait profile was

developed for each occupation within the McDOT (which includes the archive DOT).

The McCroskey worker traits include general education development, aptitudes (excluding SVP, general, verbal and numerical aptitudes), physical capacities, and environmental tolerances. A new "O*NET expanded transferability of skills paradigm" was developed with 28 occupational classification codes, worker traits, temperaments, and "aggregate" variables. These codes include MPSMS and work field codes, SVP, data people things, GED levels, 11 types of aptitudes, and four temperaments (directing, working with people, influencing, and expressing feelings). Cluster analysis was completed with the occupations, forming 1172 occupational unit classification groups. The manual has extended data on reliability and validity (McCroskey, 2008; McCroskey, Grimley, Williams, Hahn, Lowe, Wattenbarger, Stein, & Dennis, 2002).

IODC Evaluation of McDOT

The IODC committee contacted Vocationology, Inc. regarding use of the McDOT software for the evaluation. IODC was provided with complementary software for each committee member and was provided one training session on use of the software. Vocationology was also available for questions and any issues that may have arisen throughout the evaluation process.

The following are the findings of the committee. All of the new job analysis information in McDOT comes directly from the O*NET database. This is both positive and negative: positive in that more cognitive elements are included in O*NET; negative in that O*NET cannot be utilized directly for transferable skills analysis or in the Social Security Administration's disability determination process. McDOT includes analyses of the inter-correlations among various worker traits characteristics. It has substantial reliability and validity data. On the negative side, Vocationology has not conducted any independent job analyses for its database. As O*NET was initially derived from DOT data, O*NET itself is a confounded data source as an update to the DOT. Thus, McDOT incorporated all the problems of both the DOT and O*NET. Further, McDOT used data primarily from the early O*NET database that was based strictly on legacy analyst ratings and does not reflect newer incumbent ratings that have only recently been fully captured and reported. SSA has reported that it will not use any database with O*NET included in it. The statistical processes used to develop the McDOT database are very complex and difficult for many individuals to understand or explain to judges, juries, attorneys, and others.

The Position Analysis Questionnaire

The Position Analysis Questionnaire (PAQ) is a job analysis methodology developed around 1972 by McCormick, Jeanerette and Mecham. The current version in use is the third, PAQ Form C (1989). There are 187 items in the PAQ, including eight items related to compensation issues. The job elements are worker-oriented, with six domains: information input; work output (physical activities and tools); mental processes; relationships with others; job context (physical and social environment); and other work characteristics (such as pace and structure).

The terminology, definitions and rating scales are different from those used in the DOT/RHAJ. There are 15 different rating scales. Typically, each scale has a selection for "does not apply" and other selections that may vary from never to continuously; very infrequent to very substantial; very limited to very substantial; very minor to extreme; very limited to high; and very high to very low. Most scales are either a five or six point scale. On the answer sheet, however, there is the potential to rank in between each scoring level, so that on a six-point scale, there are actually 11 options for scoring. Ratings are typically completed by trained job analysts or supervisors.

There are numerous studies regarding the reliability and validity of the PAQ. The technical manual reports a study in 1978 where two analysts rated 325 jobs and then the analyses were compared to each other. The average reliability coefficient in this study was .68. In a second part of this study, the same analysts were asked to analyze the same jobs 90 days later. The average rate – re-rate reliability coefficient was .78. The average item reliability of the PAQ was found to be .80 (Gibson 2001). The PAQ does not describe specific work activities; therefore profiles may appear similar when they are not. Readability is an issue, as the PAQ requires approximately post-college graduate reading levels in order to complete the analysis (Gibson 2001).

According to Harvey (2004), the PAQ scales work well for blue-collar types of jobs, but are of limited use for managerial, supervisory, executive, and professional types of occupations. Because of this flaw, PAQ developed a separate questionnaire to handle these higher-level jobs. Having a separate instrument is problematic because "such a strategy implicitly assumes that *zero* overlap exists between the items (and work dimensions) that characterize MSEP [managerial, supervisory, executive and professional] versus non-MSEP jobs" (Gibson, 2001, p.3).

PAQ developed the *Disability Analysis Questionnaire* (DAQ) which more closely resembles the items from the DOT/RHAJ. According to ERI, it includes 99 questions from the PAQ that are most closely related to the DOT/RHAJ. PAQ gathers occupational information

from incumbents utilizing the DAQ (personal communication, Jonas Johnson, ERI).

The Enhanced Dictionary of Occupational Titles (eDOT) & IODC Evaluation

eDOT is a database and software program developed by the Economic Research Institute (ERI). ERI was founded in 1987 as a provider of compensation information to employers. "The eDOT project is a data collection effort to preserve and update the DOT" (Michael Gillie, personal communication, September 17, 2007). It is the software that manages the PAQ data. eDOT stands for the *enhanced Dictionary of Occupational Titles*. Currently called the "*Occupational Assessor*," eDOT is available as a subscription from ERI ((IODC training sessions with ERI, 9/18/07 and 10/9/07; eDOT Methodology, April 2008).

ERI began the eDOT Skills Project in 2002. The eDOT Skills Project is a system for collecting and storing job analyses and updating the DOT. In 2004, ERI purchased PAQ and together they have managed the eDOT Skills Project. The database includes the 64 *Selected Characteristics of Occupations* from the DOT plus 35 new characteristics, such as keyboarding, education, mental and cognitive factors, etc. Within those 35 characteristics they have included the 20 measures found in the Social Security Administration's Mental Residual Capacity paper. Thus a total of 99 factors are measured (IODC training sessions with ERI, 9/18/07 and 10/9/07; eDOT Methodology, April 2008).

eDOT actually consists of two databases: the archived DOT and the new eDOT database. ERI reseeded the original raw data from the DOT measures to calculate standard deviations and standard errors for that data. Each data point within eDOT has an associated reliability, standard deviation, and standard error calculated. As the data is fluid, these numbers regularly change (eDOT methodology, April 2008).

ERI has been working to redefine the DOT list of occupations to include changes in the labor market due to technology, new production methods and streamlining of the work force. A variety of individuals contribute data to eDOT: subject matter experts who have been trained on the PAQ; major disability carriers; vocational rehabilitation consultants; workers compensation analysts; Fair Labor Standards Act reporters; modeled analyses; and incumbents visiting CareerBuilder.com, SalariesReview.com, SalariesExpert.com, and Salary ExpertPro (eDOT methodology, April 2008). This collective research reflects the results of over 100,000 third-party subject matter expert field job analyses, and 2 million incumbent Internet self-job analysis inputs collected during the last 15 years.

eDOT is currently used by many individuals and organizations. Career counselors use the software to help recent graduates and unemployed individuals find jobs based on their education and interests. Insurance carriers utilize it for disability determination. Vocational experts use eDOT to determine what work individuals' residual functional capacities allow them to perform in the US economy (IODC training sessions with ERI, 9/18/07 and 10/9/07; eDOT Methodology, April 2008).

eDOT's sampling plan is one of convenience. Data is taken as it is submitted. Overall, ERI reports that there are approximately 1,000 to 1,500 PAQ job analyses done per year, the majority of which are completed by incumbents via Career Builder or other websites (IODC training sessions with ERI, 9/18/07 and 10/9/07).

As of January 2008, ERI/PAQ had added 717 new occupations to eDOT; removed 4,103 jobs; and verified the existence of 8,658 jobs; for a total of 9,375 jobs in the database, compared to 12,761 jobs in the DOT and 812 in O*NET (personal communication with Gale Gibson, Vertek, 2008). There are several differences between the original DOT and eDOT. eDOT uses a revised version of the 1987 Standard Industrial Classification system (SIC), developed by ERI, called the eSIC. PAQ/ERI had not assigned work fields (WF) or materials, products, subject matter, or services (MPSMS) to the new jobs they had added to eDOT until July of 2008. PAQ has a six-point scale for rating certain worker traits: never, rare, occasionally, frequently, constantly, and continuously. The DOT uses a four-point scale: never, occasionally, frequently, and constantly. At some time, PAQ/ERI would like to convert the DOT four-point ratings to the PAQ six-point scale (eDOT methodology, April 2008).

Changes to jobs in eDOT can be seen in the following example: for the job title of order clerk, the SVP has been changed from four to five; temperaments correlate to those of O*NET; aptitudes match the PAQ; strength demand has been changed from sedentary to light; reaching as been changed from frequent to occasional; there is no designation for work fields (WF) or materials, products, subject matter or services (MPSMS) (IODC training session with Sharon Shou, UNUM, 1/23/08).

ERI has not completed its revision of the DOT. The eDOT methodology published in April of 2008 includes a list of the many projects ERI wishes to accomplish as part of this project. Some of these include: refresh work fields; refresh materials products subject matter and services; add military occupations; add over 1000 new jobs they have been working on; and thoroughly review the raw database (eDOT Methodology, April 2008).

eDOT Evaluation

The IODC contacted ERI to inquire about the eDOT database and its availability for review and evaluation by the committee. ERI provided complementary software to IODC committee members, including eDOT (Occupational Assessor Software). The first step in the process was to read the methodology and development documents on both the PAQ and eDOT. Subsequent to this, ERI provided two training sessions with the committee in the use of eDOT and answered any questions related to PAQ and eDOT. After having an opportunity to utilize the eDOT software, the IODC committee met with ERI representatives during the IARP Forensic Conference in the fall of 2007. ERI was available to the committee throughout the evaluation process to provide additional information as needed. An eDOT user at UNUM provided training and a critique of eDOT as it relates to her use of it. Vertek, parent of OASYS, has been working with ERI to incorporate eDOT into its OccuBrowse product. The committee was provided with beta versions of this incorporation of eDOT and OccuBrowse.

ERI's intention in updating the DOT is admirable. ERI has been creative in the data gathering process. They have included cognitive elements previously omitted; separated out physical demands; presented raw data and data sources for professional study; and are staffed with industrial/organizational psychologists who are familiar with job analysis.

There are a number of factors that need remedying in order to make eDOT suitable for DOT replacement. Currently, the sampling plan is one of convenience. A stratified sampling plan would need to be developed. Industries and occupations do not always match up. On occasion there are several listings for the same occupation, which is confusing. Internal controls for quality assurance would assist this effort. Coding of occupations in eDOT is different than that used in the DOT, specifically related to the last three digits of the nine digit code. eDOT utilizes mean trait ratings rather than the mode trait ratings used by the DOT. Methods of data aggregation used to define new occupations is unclear. Also unclear is the methodology used to translate PAQ data into DOT terms. Rating scales used are unclear and exists in excessive numbers. Another issue is that eDOT is based on the flawed DOT.

ERI attempts to control for sampling errors by using multiple sources of survey data. This does not work well for jobs at lower skill levels. For example, worm packers are unlikely to appear in either any of the financial data collected by ERI or in online job search networks, but the job does exist. Some jobs are advertised by word of mouth, or by a sign in the local café, or in a posting in a small local newspaper that has no presence on the Internet. The difficulty for anyone up-dating the DOT will be in identifying those jobs that do not appear through ordinary means.

There are several ways in which jobs are added to the eDOT database. A job can be added once there are three PAQ surveys for that job and the salary has been analyzed; once there are three job analyses; and also numerous requests from customers to add the job. The job will be considered for addition if loan verification counts (the job title appears on a loan document) for that occupation are greater than 100. Ideally, PAQ/ERI needs at least 250 occurrences of the job within the national economy in order to include it in eDOT (IODC training sessions with ERI, 9/18/07 and 10/9/07). Examples of jobs added to eDOT include: computer systems administrator, 030.162-500; call center representative, 299.357-201; assistant manager, retail store, 185.167-505; executive assistant, 169.167-911; sales assistant, 209.562-800; maintenance helper, 806.687-011; CAD/CAM technician, 017.262-519.

Jobs are also dropped from the active eDOT database. Any job analyses that are over 15 years old are dropped from the database (with the exception of the original DOT job analyses). ERI uses face validity as a method for dropping jobs, although face validity is viewed as being an inadequate measure when it is viewed against research or psychometric standards in measurement or in meeting the scientific and technical requirements addressed under *Daubert* in gaining acceptance in the courts, as it is a subjective measure that can potentially vary considerably. As reported by the company in their methodology description, ERI reports dropping jobs such as abalone diver, asbestos remover, et cetera based upon the use of face validity. If their salary software subscribers request information on a particular job 10 or fewer times per year, that job is also dropped. Other methods ERI uses to delete jobs includes: no mention of the job on any electronic job board; no mention of the job on the California state workers compensation rolls; no finding of the job in any salary surveys; no one visiting Career Builder and searching for this job title; no finding of the job in any labor/proxy/form 990 records; nor any mention of the job in any loan verification record (IODC training with ERI, 9/18/07 & 10/9/07).

Examples of other jobs removed from the active eDOT database include: immunohematologist (078.261-046); military recruiter (166.267- 026); quality assurance analyst (033.262-010); electrical inspector (168.167-034); announcer (159.147-010); and greenskeeper (406.683-010). It was easy to verify through online search engines that there were job openings for three of these jobs, picked at random, including two jobs for immunohematologists, 679 jobs for announcers (some are repeats), and 45 positions for greenskeepers.

Descriptions are not as detailed as in the DOT and are often generic, such as "supervises personnel for as-

signed area of responsibility." Some jobs are already in the DOT, and it is not clear these are "new" jobs, such as engineering manager and surveyor. Other jobs appear under many iterations of the title: A B seaman, able seaman, able-bodied seaman, etc. Some of the industry designations are incorrect.

UNUM's Evaluation of eDOT

A committee of UNUM's vocational rehabilitation consultants was selected from various lines of its disability insurance business, including long term and short term disability, to analyze vocational rehabilitation products as potential alternatives to or support for the DOT. Measurements and tracking methods were established to determine the value and cost effectiveness of these products. A study was conducted over a period of 5 months to track the use of e-DOT versus other available resources including the DOT, Enhanced Job Analyzer, Occupational Outlook Handbook, O*NET, OASYS and other occupational information resources.

Each of the participants were required to complete two occupational analyses per week using the eDOT/PAQ and other available resources (DOT, OOH, O*Net, etc). Each of the participants were also required to review the results of a vocational assessment completed by a contracted vocational rehabilitation consultant once per week in order to determine if any value could be added by the application of eDOT. A Product Impact Study Work Sheet was developed to track occupational information and the results from each of the vocational resources.

The results of the UNUM study showed that eDOT provided additional information beyond the DOT in 49% of the cases reviewed. Of the 49% of the cases affected, eDOT provided additional physical requirements in 41% of the cases; updated occupational information in 25% of the cases and psychological factors in 4% of the cases. The use of eDOT provided vocational information that would normally have required vending to external sources by almost 80%, thus saving time and providing validated results. The eDOT was also noted to include more up-to-date occupational information. This was especially obvious when reviewing information technology occupations.

An analysis of the methodologies used to obtain occupational information and the 5-month study involving regular users of eDOT in the disability industry yielded advantages and challenges to using eDOT to identify occupational characteristics and transferability of skills to other occupations. Advantages included: updated occupations since the last revision of the DOT; identification of trends and changes in physical demands which have occurred in the work place since the last update, including the impact of automation, computerization, staffing patterns and changes in the scope of duties performed within an occupation over the last 17 years; broadened spectrum of occupational requirements provided, including discrete factors such as sitting, standing, walking, keyboarding, and reaching upward and downward; ongoing data collection allowing for a more dynamic database of information; the availability of raw data allowed for more in-depth analysis of available data; user compatible with easy navigability; and the ability to compare new data with archived DOT data.

Challenges to using eDOT included: collection of data from incumbents and respondents on the SalaryExpert.com website who had no training in assessing the essential duties and differentiating incidental, non-essential or job-specific duties and activities opens the potential for inaccurate raw data; raw data is averaged based on the mean, rather than the mode, causing periodically skewed data, e.g. if the raw data collected on data clerk (#209.687-010) includes 24 at sedentary, 7 at light, and 2 at medium exertional levels, the occupation would be classified at light; the dynamic nature of the ongoing data collection can result in changes in the data from one evaluation period to another; although improving, there are occasionally variances between the *Selected Characteristics of Occupations* (SCO) reported in the "Physical Demands" section and the exertional classification, e.g. an occupation categorized as Sedentary would report lifting 10 lbs. occasionally up to < 20 lbs. frequently; and a clearer connection between the traditional use of MPSMS and use of the SCOs and GOE codes in transferability of skills analysis.

In conclusion, the results of the UNUM study agreed with the findings of Social Security Job Demands Project, Methodology to Identify and Validate Critical Job Factors, Deliverable 9 dated November 3, 2002 in relation to the PAQ job analysis system. This study determined that compared to other job analysis methodologies (including The Common Metric Questionnaire, Fleishman-Job Analysis Survey, Occupational Analysis Inventory, and O*NET), the PAQ, in addition to well established validity and reliability, was also placed on the top of the list for both usability and practicability. This is also true for ERI and PAQ's eDOT use in disability determination.

IODC Findings & Recommendations

The IODC was unable to identify and endorse a ready-to-use database that meets both the needs of IARP members and SSA. eDOT has the potential to be that database, but there are many methodological problems which need to be resolved prior to its usefulness for transferable skills analysis and in litigation settings. Until a better product is available, the IODC recommends continued use of the DOT; however any conclusions that are reached through use of the DOT

should be tempered with the professional's clinical knowledge of occupations and the dynamics of the labor market.

Recommendations for DOT/O*NET improvement

Harvey (Fine et al., 2004) noted the positive factors in the DOT including: the use of skilled analysts to conduct the job analyses; the use of an occupational title taxonomy; task level descriptions; and a foundation built upon data-people-things. Harvey reported that these aspects are missing in O*NET. Miller et al. (1980) noted that the DOT, despite its many problems, is a rich source of occupational data. They encouraged people to continue to use the DOT until a proper replacement could be generated.

The Advisory Panel for the Dictionary of Occupational Titles (APDOT, 1993) stated that the purpose of the new database of occupational titles (DOT) *"should be to promote effective education, training, counseling and employment of the American workforce. The DOT should be restructured to accomplish its purpose by providing a database system that identifies, defines, classifies and describes occupations in the economy in an accessible and flexible manner. Moreover, the DOT should serve as a national benchmark that provides a common language for all the users of occupational information"* (p.6).

In its 1993 report, APDOT gave recommendations for data collection, dissemination, and implementation. The panel noted the importance of covering all occupations in the United States economy within the DOT; that the Department of Labor use one standardized occupational classification system so that labor market information could be easily compared; and recommended sampling techniques be used in the data collection of occupational information for the DOT to ensure representation, accuracy, and consistency of information, with reevaluations of each occupation occurring every five years (p.6). Because of the expense of employing occupational analysts, APDOT encouraged the use of job analysis data from other parties, which could include private sector rehabilitation professionals. Regarding dissemination, APDOT recommended the new DOT be available in all manner of formats, for use by anyone.

Harvey's (Fine et al., 2004) recommendations for DOT/O*NET improvement include: development of an online system; maintenance of "occupational title granularity"; use of expert raters; rating observable aspects of the job in consideration of data-people-things; and using the worker-function method of functional job analysis to define work.

Botterbusch (1993) gave specific recommendations for improvements to the DOT: expressing job training in days, weeks, months and inclusion of the academic, apprenticeship, and on-the-job training information, with the potential to replace SVP; replacement or elimination of data people things; elimination of temperaments as they offer little value; restatement of environmental conditions in positive terms; maintenance of GED and GOE, with an update of the GOE; addition of factors such as job complexity, social aspects of jobs, and job mobility; and the use of work fields and materials, products, subject matter and services to cut down on the redundancy in the classification system, thereby reducing the number of total titles.

Miller et al. (1980) stated that a primary issue in improving the DOT would be establishment of a permanent, professional research unit which would keep the DOT updated and would be available to expand research efforts. They offered two additional general recommendations and 19 specific ones for improving the DOT. Some of these recommendations included: concentrating efforts on job analysis and methods for improving procedures and identifying new occupations; defining the word "occupation" to help solve the aggregation problem; establishing an advisory commission to the program; continuing to use on-site job analysis as the primary method for collecting data, which would be conducted by trained analysts; utilizing any sampling plan; designing some type of procedure to keep track of changes in job content and in new and existing occupations; and including all jobs within the economy. They also advocated for providing regular updates to the public rather than waiting every 10 plus years for publication on the new edition, as was done in the past.

Miller et al. (1980) surveyed users of the DOT and asked for improvements people would like to see in the DOT. Two of the recommendations included publishing career ladders with each occupation (this information is already gathered); and to include the worker trait information directly in the DOT, rather than in a separate publication.

One major obstacle in updating the DOT is cost. Not only is job analysis an expensive venture, it is also time-consuming. There are several different methods to attempt to reduce the time and cost expense of job analysis. One of these is having incumbents complete the job analysis (this is the O*NET's procedure). Another is using holistic rating scales in place of decomposed ratings. In a study done on the PAQ, Butler and Harvey (1988) concluded that holistic ratings— where one rates a job as a whole versus reading each task or job element— is not a good method for reducing expense and time. It does not provide enough data. In their study they had three groups completing the PAQ: professional job analysts, undergraduate students unfamiliar with the PAQ, and graduate students familiar with the PAQ. They found that profes-

sional job analysts achieved acceptable reliability when using decomposed ratings. All three groups were unable to accurately complete holistic ratings on the PAQ. Part of the problem with holistic ratings is that it requires the rater to consider a large amount of information when making one rating.

The National Research Council (1999) addressed critical issues in the development and maintenance of occupational database systems, particularly in relation to O*NET. These issues, however, are applicable to any occupational database system. In order to maintain the integrity of the data and credibility with users, the database needs to be updated on a regular schedule. An establishment-based sampling plan will likely be inadequate. It is unlikely to capture lesser known occupations and those that tend to be self-employed. To capture all jobs, any sampling plan should include the following as part of the plan: professional associations, unions, business groups, etc. Additionally, there is no immediate payoff for employers to cooperate with job analyses, at least during early development. When the project is completed employers may be able to appreciate the benefits and usefulness of the occupational database and thus may be more willing to cooperate in the future. It will be important that the database tracks changes in work over time. In order to be valid, the National Research Council recommends the following: identify the research question; define the population; establish and achieve the sampling plan; measure relevant factors; and correctly interpret and analyze the data.

Truthan (1989) pointed to the fact that while every DOT code has a single SOC, GOE, and census code the reverse is not true. There are numerous DOT codes per GOE code, for example. This makes it difficult to compare information. Additionally, the SOC, GOE, census and DOT all have their own coding systems. It would be much simpler if there were one occupational coding system in use throughout the United States.

It may be recalled that manufacturing represented 67% of the fourth edition of the DOT, while retail trade represented 4% and services 7%. This is in contrast to actual representation of 8% of all establishments in manufacturing, 29% in retail trade, and 27% in services at the time the fourth edition was completed. As of June 2008, manufacturing represented 9.8% of the total establishments with the retail trades representing 11%, and services accounting for 84% of all establishments (Bureau of Labor Statistics, September 2008). There are significant changes from the industry distribution in the 1970s that would need to be carefully examined in any update of the DOT.

Moving toward an improved DOT

The IODC makes the following recommendations for building a better DOT:

Job Analysis Issues

1. Identification of an agreed-upon job analysis format that is standardized, reliable, and valid.

2. Reevaluation and redefinition of worker characteristics, for example, what constitutes a "physical demand?"

3. Development of improved definitions and indicators for attributes and scales for each.

4. Expanded physical demand ratings, such as sitting, standing, walking, reaching (above shoulder versus forward versus downward), vehicle operation, lifting, carrying, pushing, pulling, use of controls (hands, feet), bilateral or unilateral upper extremity use, exposure to chemical agents, biological hazards, latex, animals, potential food allergens, photic triggers (seizure potential).

5. Addition of "basic" skills including: keyboarding, technology use (computer user, familiarity with multiple applications, training others, troubleshooting, et cetera.).

6. Addition of attributes, including cognitive requirements and deletion of other attributes.

7. Indication of preferred personal qualities of workers for successful performance including: attitude, initiative, persistence, resourcefulness, honesty, flexibility, team orientation, communication skills, tact, organization, leadership, efficiency, personality, reliability, quality orientation, attentiveness, et cetera.

8. Indication of acceptable methods of preparation for entry into occupations, such as formal education required, vocational school, apprenticeship, in-service training, on-the-job training, certification and licensure issues, and prior experience needed.

9. Indication of barriers to hiring for specific occupations including criminal history, appearance, personal hygiene habits, monocular vision, et cetera.

Data Collection

1. A comprehensive multilevel, stratified sampling plan.

2. An audit to identify where occupations are found within businesses and industries of all sizes including small employers and self-employment.

3. The use of only trained/qualified professionals as job analysts.

4. Determination of how job analysts will be trained and retrained.

5. Identification of whether job analyses will be completed solely by resurrected field offices within the public sector or with help from the private sector.

6. Improvements in the technical quality of data and methodologies used; this must be ongoing in order to ensure the data's defensibility.

7. The coding methodology used must make sense.

8. Avoidance of incumbent ratings due to reliability problems with this data.

9. Use of an online system for input of job analysis data, with quality controls for input and output of data ensured at all stages of development of the database.

10. Insurance that the database reflects the economy/labor market.

11. Multiple measures for each attribute.

12. Appropriate scaling for each attribute and sub-measures that make sense.

13. Identification of variables needed in order to complete a transferable skills analysis-job match; once these are identified, develop scales with use of accepted psychometric practices to increase reliability.

14. Proper instrumentation and equipment must be available to conduct objective, and measurable job analyses rather than strictly by observation.

15. The total number and range of attributes should be limited to what an analyst can handle without diminishing the quality of the data being gathered.

Data Use

1. The methodology used will need to be explained in the simplest of terms as possible for ease of customer understanding and use.

2. Processes and methodologies, as well as results of data usage, must be easily explainable to ALJs/judges, juries, attorneys, etc.

3. The software used to access data and perform transferable skills analysis and other tasks should be simplified wherever possible to reduce errors and improve understandability.

4. The new DOT needs to be available as a stand-alone database of information, not solely as part of a transferable skills analysis product.

5. End-users should be allowed to search, compare, and retrieve information in the database.

6. Development of crosswalks should be well explained.

7. There should be the capacity to generate printed reports.

8. Provide data to end-users in a variety of formats, including online and in print; it is particularly important that the data not require an Internet connection so it can be accessed during Social Security hearings.

9. The database author should have a vocational rehabilitation person on staff for the development phase and for customer support.

Database Updates

1. The database needs to be continuously updated.

2. Changes in the labor market need to be continuously monitored and reflected in the database.

3. Project staff should work closely with OES Long-Term Projection Survey and other BLS statisticians to learn of new and emerging occupations and industries.

4. Sufficient funding must be provided to develop an improved database and to ensure its maintenance into the future.

Integration of the DOT to other sources

1. Methods should be established for integrating the new DOT with existing related classification systems (SOC, O*NET, NAICS, etc.).

2. The database should be integrated with updated companion databases, including the *Guide for Occupational Exploration.*

2008 Social Security Administration RFP for a Temporary DOT Replacement

On February 29, 2008, the Social Security Administration (SSA) published a Request for Information (SSA-RFI-08-1500) looking for organizations interested in serving as an Independent Evaluator for the purpose of evaluating electronic databases as potential replacements for the DOT in their Disability Determination process. A second Request for Information was published on March 5, 2008 (SSA-RFI-08-1600) searching for entities who have already developed a replacement database for the DOT that could be considered for use in SSA's Disability Determination process. Requests for Quotations were later published and contracts awarded in August of 2008 to CPSSI, Inc. of Michigan for the occupational information portion and to ICF International as the Independent Evaluator. The evaluation is expected to last nine months. If appropriate the SSA would like to be using updated DOT-like data by December of 2009.

Social Security Administration's Occupational Information Development Advisory Panel

In late 2008, SSA established the Occupational Information Development Advisory Panel (OIDAP) comprised of 12 members chosen for their occupational expertise in a wide variety of settings. Panel members will analyze the occupational information used by SSA in their disability programs and provide expert guidance as they develop an occupational information system (OIS) tailored for these programs. This Panel will provide guidance on their plans and actions to replace the *Dictionary of Occupational Titles* and its companion volume, *The Selected Characteristics of Occupations*. The SSA will tailor the OIS specifically for their disability programs. OIDAP has an initial 2-year charter, renewable as needed to guide the development of an updated DOT.

Conclusion

Creating or updating a national database of occupational titles, including the characteristics of the work currently performed in the United States, is a huge endeavor. In and by itself, it is gigantic enough, but when coupled with the information on necessary workers characteristics to perform the job, an incredible amount of information is needed to provide both an accurate and a usable description. The sensitivity of the tools used to gather the data is as important as their specificity, rendering the task an almost impossible one to accomplish.

Despite the many flaws the IODC Committee are forced to observe in its design and in its usability, the DOT has been and continues to be a very useful source of information for rehabilitation professionals trying to match workers with disabilities to existing work possibilities. Attempts to enhance the current DOT have proven to present its own load of challenges and flaws, along with excellent ideas to better this occupational database.

After careful analysis of the history and design of the DOT and other occupational databases, the IODC recommends practical ways to improve the DOT with an underlying rationale of maintaining the database on a strong job analyses foundation to enhance its validity. Recommendations for designing and managing job analyses data collection are offered to strengthen this foundation, followed by recommendations for general data collection and updates, data use and integration with other occupational databases.

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CEU INFORMATION

This article has been approved for continuing education credits for CRC, CCM, and CDMS for IARP members through the IARP Certification Maintenance Program. At the time of printing we have requested approval of 1.0 credit. To obtain CEUs after reading the article, the following is required.

1. **Complete both the exam on page 84 and the evaluation form on page 50.**

2. **Write a check to IARP for $15 (IARP professional members), $20 (IARP associate members), or $25 (non-members and subscribers) to process the request.**

3. **Send everything, including your name, address, phone/fax numbers, CRC, CDMS, and/or CCM number(s) to the address below.**

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Continuing Education Credit Questions

Questions are based on the article, *A Call to Update the DOT: Findings of the IARP Occupational Database Committee*, by Heitzman et al., beginning on page 63 in Vol 17(2).

1. **In the development of a replacement resource for the *Dictionary of Occupational Titles (4th Ed., Rev..*, which of the following statements is not a recommendation of the IODC of an improved database:**
   a. Job analysis performed by incumbents should be used as the primary method of data collection because of the high levels of reliability that have been reached by incumbents in various research study;
   b. A multidimensional stratified random sampling design should be developed which would result in a truer representation of occupations in the U.S. labor market;
   c. Multiple measures of work requirements and worker attributes need to be developed for each of the characteristics in the work profile, in order to better represent the complexity of each of the attributes selected and to provide a more precise and accurate measure of each;
   d. Include multiple cognitive attributes in the work profile, while also eliminating some of the previously included attributes which have been found to be of lesser importance;
   e. All of the above are recommendations of the IODC for an improved occupational database.

2. **Which of the following groups of people have been found to embellish or rate the various job attributes higher than others when conducting job analyses?**
   a. Incumbents
   b. Supervisors
   c. College students in a general psychology course
   d. Vocational rehabilitation professionals
   e. Vocational education instructors

3. **The sampling plan used in gathering job analysis data on the jobs and occupations included in which of the following occupational databases, has been shown to be both highly representative of the U.S. labor market and easily defensible in a court of law:**
   a. Dictionary of Occupational Titles (4th Ed., Revised.
   b. O*NET
   c. eDot (D.O.T. revision by ERI.
   d. McDOT
   e. None of the above

4. **Which of the following attributes is not a part of the data included in the D.O.T., but has been identified as being essential to understanding the demands of jobs and occupations which are in the current U.S. labor market?**
   a. Physical capacities such as *strength*
   b. All of the Aptitudes reported in the D.O.T. and *Selected Characteristics of Occupations in the Dictionary of Occupational Titles*
   c. Cognitive capacities
   d. a. and b.
   e. None of the above

5. **The Social Security Administration has determined that O*NET meets its needs for their Disability Determination process and have adopted it.**
   a. True
   b. False

6. **The Inter Organizational Task Force (IOTF. was created by IARP to make O*Net functional for vocational purposes. They succeeded in:**
   a. updating the DOT to the eDOT
   b. creating a process using O*Net efficiently for transferable skills analysis purposes
   c. clarifying the reasons for O*Net inability to meet the disability rehabilitation community
   d. recommending the abandonment of the DOT as an appropriate tool for Social Security Administration adjudication.

7. **The foundation for the DOT is job analysis. Of the primary formats of job analysis, the DOT information was gathered using:**
   a. a work-oriented job analysis
   b. a worker-oriented job analysis
   c. a combination of work and worker oriented job analysis
   d. incumbent questionnaire

8. **Which answer most represents the process/results of the job analyses conducted to create the DOT?**
   a. all jobs in the DOT were analyzed by a competent job analyst who observed the job at least once.
   b. analysis of jobs happened when the job was available in the geographical area where the field office was located and the field analyst was allowed to observe the job.
   c. analysts were bound to use the same standardized method (HAJ. to conduct job analysis, on which they had been extensively trained.
   d. analysts were required to precisely measure intensity, duration and frequency of physical demands using state of the art tools.

9. **Eighty percent of the DOT titles were last reviewed:**
   a. 30 years ago
   b. 25 years ago
   c. 20 years ago
   d. 15 years ago

10. **The IODC recommendations include:**
    a. improvement of the DOT by perfecting job analysis issues, data collection and use, and update schedules.
    b. using the McDOT or the eDOT instead of the current DOT because of the needed improvements they bring to the current DOT
    c. recommending that O*Net be used for vocational purposes.
    d. none of the above.