# Determining the Occupational Reinforcer Patterns for O*NET Occupational Units

**Volume I: Report**

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# Acknowledgment

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# Executive Summary

The U.S. Department of Labor's (USDOL's) Office of Policy and Research has developed the Occupational Information Network (O*NET), a comprehensive system for collecting, organizing, describing, and disseminating data on occupational characteristics and worker attributes (see *O*NET Final Technical Report*, 1998). O*NET is the replacement for the *Dictionary of Occupational Titles* (*DOT*; U.S. Department of Labor, 1991). O*NET includes the Content Model, a skills-based structure that serves as the framework for organizing the information describing the world of work presented within O*NET (see *Development of Prototype Occupational Information Network (O*NET) Content Model*, 1995). The Office of Policy and Research initiated several projects aimed at producing valid and reliable data covering a majority of the variables described in the O*NET Content Model. This report focuses on the effort to generate work-related values information included in the Worker Characteristics domain of the model (i.e., identifying features of employment which O*NET users may value or view as personally important). Inclusion of such work importance (i.e., work values) information within O*NET provides an important data set for career guidance and research. In December 1998, O*NET 98 was released, the first presentation of the O*NET data to the public. For more information, see O*NET 98 Viewer User's Guide (USDOL, 1998).

It is important to note that USDOL's Office of Policy and Research has developed career exploration and development tools in an effort to create more complete, flexible services. The career exploration tools link directly to O*NET. For example, the Work Importance instruments USDOL has developed will enable users to link their results directly to the work values information provided in O*NET. These materials will allow individuals to use a variety of assessment information about themselves (e.g., vocational interests, skills and abilities, education, experience, as well as work values) to explore careers individually, with a career counselor, or in a group.

The U.S. Department of Labor's (USDOL's) National O*NET Consortium contracted with the Human Resources Organization (HumRRO) to complete a project aimed at developing two measures of work values. The work values measures would be part of a set of measures to complement the USDOL Occupational Information Network (O*NET), a new computerized database of occupational information that replaces the *Dictionary of Occupational Titles* (*DOT*; U.S. Department of Labor, 1965, 1977, 1991).

The work values project had three distinct parts. The purpose of Part I was to design and evaluate a computerized measure of work values. The purpose of Part II was to design and evaluate a similar paper-and-pencil measure of work values. The purpose of Part III was to determine the Occupational Reinforcer Patterns (ORPs) of the 1,122 Occupational Units (OUs, as in groups of occupations from the *DOT*) which are contained in O*NET. ORPs are OU specific profiles of scores on need statements that characterize the nature of the work (e.g., authority, creativity) and conditions of the work environments (e.g., compensation, advancement potential). ORPs are based on actual ratings of the presence or absence of the need reinforcers in specific occupations. The ORPs are to be used in conjunction with the work values measures, the Work-Importance Locator (WIL-P&P; paper version) and the Work Importance Profiler (WIP-C; computer version). This report focuses on Part III, the determination of the ORPs.

The research design for generating ORPs involved obtaining work values score profiles from two sources: a) regression equations that produced estimated work values scores, and b) an SME (Subject Matter Expert) study in which work values scores were derived from expert judgments of occupational analysts. The SME study was composed of three phases: a) initial development of materials for rating the ORPs for the OUs, b) a Pilot Study to refine the materials and determine whether non-incumbent raters could provide reliable results, and c) a Main Study in which ORPs for the 1,122 OUs in O*NET were created based on their ratings on the 21 need statements. After comparison of the characteristics of the two sets of work values scores, the SME ratings data were selected as the basis for forming ORPs.

Rating scales were developed using need statements from the Minnesota Importance Questionnaire (MIQ) and the Minnesota Job Description Questionnaire (MJDQ). Anchor occupations were added to the rating scale for each item to represent occupations that are high, medium, or low on the need reinforcer. The anchors help raters make their judgments. After this initial development, a Pilot Study was conducted in which 9 non-incumbent raters (industrial/organizational psychology graduate students) rated 30 occupations or OUs on the 21 items. Interrater reliabilities for all but three of the occupations/OU rated were .75 or higher, indicating consistency among raters. In addition, most of the ORPs from this pilot study were correlated .50 or higher with ORPs for the same occupations published in 1986 (Stewart et al., 1986). This indicated good consistency between incumbent raters who had rated the occupations more than 10 years ago and the non-incumbent raters used in this pilot. This evidence supports the idea that it is reasonable to use such non-incumbent raters for this type of task. Additional information was gathered, and refinements were made in the training and materials presented to raters in the Main Study.

In the Main Study, 17 occupational analysts and industrial/organizational psychology graduate students each rated the extent to which each of the 21 work needs was reinforced by each of 561 OUs (the 1,122 OUs were divided into two sets of 561 each). Each judge provided ratings for just one OU set, and one judge dropped out of the study, leaving eight ratings for each need for each OU. Raters provided profiles of adequate and acceptable reliability, with mean and median interrater reliabilities in the .80s. This indicates considerable consistency among raters in this study across both the needs and OUs; they obtained higher reliabilities than those obtained from job incumbents during the initial phase of the O*NET data collection. The average correlation between need profiles from incumbent ratings and from ratings of judges in this study was .37. Incumbents tended to rate their jobs higher on the needs in the initial O*NET data collection, which could be due to the incumbents' tendency to inflate ratings of their jobs. For 33 percent of the OUs, the top two needs were the same for the judges in this study as they were based on the information from job incumbents obtained in the O*NET research.

The SMEs provided work value ratings based upon the capacity of each OU to reinforce a given need in today's job market. ORPs based on the SME ratings can reflect changes in the reinforcing characteristics of occupations that may have occurred over the past decade. Given the dynamism of the workplace during this time period—continuing shift to service occupations and "knowledge" work, less job security (e.g., organizational downsizing), fewer

job benefits, the changing nature of organizations (e.g., smaller, flatter, shorter product cycles, more outsourcing) the SME ratings probably have greater potential validity than estimated profiles based on somewhat dated *DOT* information.

Although the work values data have often been reported at the level of the six values rather than the 21 needs, the ORPs for the OUs, for purposes of career exploration, retain the need-level information. Data obtained from the psychometric studies of the two work values measures indicated that the 21 needs did not fit as neatly into the six values as they might have at one time. A portion of this disparity appears to be due to wording changes in the items that were incorporated during the development of O*NET. Using all 21 need scores in the ORPs increases the capacity for fine discrimination among OUs for a given client's work values profile. Comparing client/OU profiles at the level of the needs could be particularly useful for clients having prior job experience, because these individuals might not be seeking an increase in the reinforcement of a work value as much as in the satisfaction of a specific need. Indeed, work values measures are typically more helpful for experienced clients, as the complaints of experienced employees often are couched in terms of work values (e.g., insufficient pay, lack of promotion opportunities, lack of support from upper management).

The work values project produced reliable, valid measures of work values and ORPs. The data obtained from these investigations strongly supported the use of the SME ratings of work values scores for the 1,122 OUs that appear in O*NET. ORPs generated by the SMEs evidenced appreciable reliability, moderate correlation with profiles obtained by job incumbents, and reasonable patterns of work values scores across OUs.

# Chapter 1.  Introduction

## Overview and Purposes of Project

The U.S. Department of Labor's (USDOL's) Office of Policy and Research has developed the Occupational Information Network (O*NET), a comprehensive system for collecting, organizing, describing, and disseminating data on occupational characteristics and worker attributes (see *O*NET Final Technical Report*, 1998).  O*NET is the replacement for the *Dictionary of Occupational Titles* (*DOT*; U.S. Department of Labor, 1991).  O*NET includes the Content Model, a skills-based structure that serves as the framework for organizing the information describing the world of work presented within O*NET (see *Development of Prototype Occupational Information Network (O*NET) Content Model*, 1995).  The Office of Policy and Research initiated several projects aimed at producing valid and reliable data covering a majority of the variables described in the O*NET Content Model.  This report focuses on the effort to generate work-related values information included in the Worker Characteristics domain of the model (i.e., identifying features of employment which O*NET users may value or view as personally important).  Inclusion of such work importance (i.e., work values) information within O*NET provides an important data set for career guidance and research.  In December 1998, O*NET 98 was released, the first presentation of the O*NET data to the public.  For more information, see O*NET 98 Viewer User's Guide (USDOL, 1998).

It is important to note that USDOL's Office of Policy and Research has developed career exploration and development tools in an effort to create more complete, flexible services.  The career exploration tools link directly to O*NET.  For example, the Work Importance instruments USDOL has developed will enable users to link their results directly to the work values information provided in O*NET.  These materials will allow individuals to use a variety of assessment information about themselves (e.g., vocational interests, skills and abilities, education, experience, as well as work values) to explore careers either individually, with a career counselor or in a group.  Examples of career exploration materials USDOL has developed include:

1.  The **O*NET Interest Profiler**, which measures six broad vocational interest areas that coincide with the RIASEC model (Holland, 1997).

2.  The **O*NET Ability Profiler**, which measures nine different abilities directly linked to job performance.

3.  The **O*NET Work Importance Profiler**, which allows individuals to identify values that are important to them (e.g., features of employment they personally value or find to be important.

Most of these tools will be available in both automated and paper formats to meet the needs of a variety of users.

The U.S. Department of Labor's (USDOL's) National O*NET Consortium contracted with the Human Resources Research Organization (HumRRO) to complete a project aimed at developing two measures of work values. The work values measures would be part of a set of measures to complement the USDOL Occupational Information Network (O*NET), a new computerized database of occupational information that will eventually replace the *Dictionary of Occupational Titles* (*DOT*; U.S. Department of Labor, 1965, 1977, 1991).

The work values project had three distinct parts. The purpose of Part I was to design and evaluate a computerized measure of work values. The purpose of Part II was to design and evaluate a similar paper-and-pencil measure of work values. The purpose of Part III was to determine the Occupational Reinforcer Patterns (ORPs) of the 1,122 Occupational Units (OUs, as in groups of occupations from the *DOT*) which are contained in O*NET. This report focuses on Part III, the determination of the ORPs. Two additional reports have been written, one to describe the development and evaluation of the computerized work values profiler (WIP-C; please see McCloy, Waugh, Medsker, Wall, Rivkin and Lewis, 1999B) and the second to describe the development of the paper-and-pencil work values profiler (WIL-P&P; please see McCloy, Waugh, Medsker, Wall, Rivkin and Lewis, 1999A).

The ORPs developed in Part III of this project are to be used in conjunction with the work values instruments (WIL-P&P and WIP-C) developed in Parts I and II. ORPs are profiles of scores on need statements that characterize the content of work (e.g., authority, creativity) and conditions of the work environment (e.g., compensation, advancement potential) in occupations. ORPs are based on ratings of the presence or absence of the need reinforcers in specific occupations.

The items of the work values instruments are virtually identical to the items used to assess the ORPs. The primary difference between WIL-P&P, WIP-C and ORP items is the referent: the individual respondent for the work values instruments, and the job for the ORP items. For example, the work values instruments would ask whether the person's ideal job would provide an opportunity for advancement. The ORP rating form would ask whether in the occupation, workers would have opportunities for advancement. The use of virtually identical items will make linking individual assessment results with occupational information straightforward. The ORPs can be used to explore the correspondence between an individual's work values, as derived from the score reports from the WIP-C, and the reinforcing qualities of different occupations. WIP-C respondents can compare their individual work values profiles with the reinforcer profiles of a variety of occupations. Respondents will be able to view information about themselves in relationship to parallel information about jobs.

The ORPs and the two new work values instruments will be available as part of the USDOL set of career exploration tools. Other assessment tools to be made available include an ability profiler, two interest profilers (a paper version and a computer version), and a workplace literacy measure. Individuals requesting career guidance or wishing to engage in career exploration will be guided toward occupational groupings based on their scores on the various assessment tools. Along with interpretive information, users will receive score reports which include lists of occupations (found in O*NET) that fit their assessment results.

To develop the ORPs, a Pilot Study was conducted to develop materials to be used to rate the ORPs of occupations and to see whether subject matter experts (SMEs), who are not job incumbents, could reliably judge the reinforcer patterns of the OUs in the O*NET. After successful completion of the Pilot Study, the Main Study of Part III was conducted. SMEs rated all 1,122 O*NET OUs on 21 need statements. The ORPs were computed for each OU based on these ratings of the 21 needs. This development of the ORPs will be discussed in this report.

The following sections describe some historical and theoretical background on the measurement of work needs and values and ORPs. This background briefly discusses the development of the instruments that are precursors to the measures developed and used in this project. This information should help explain the foundation on which the newly developed instruments are based.

### Historical Background on Work Values: The Theory of Work Adjustment

The studies on work adjustment began in 1957 by the Work Adjustment Project at the University of Minnesota under the direction of Rene Dawis and Lloyd Lofquist. The impetus of their research was to explore aspects of an individual's work adjustment and develop assessment tools to measure and predict an individual's adjustment to work. The *Theory of Work Adjustment* (TWA) was first conceptualized in 1964 (Dawis, Lofquist, & Weiss, 1968; Weiss, Dawis, England, & Lofquist, 1964) and was given more comprehensive treatment in the book *Adjustment to Work* (Lofquist & Dawis, 1969). Early work on the theory was supported by the Rehabilitation Services Administration, Social and Rehabilitation Service, U.S. Department of Health, Education, and Welfare (Dawis & Lofquist, 1984).

The Theory of Work Adjustment is a comprehensive model of vocational adjustment based on the concept of correspondence between individual and environment (Dawis & Lofquist, 1984). The TWA postulates that vocational needs and abilities are instrumental elements of the individual's work personality, while ability requirements and reinforcer systems are significant aspects of the work environment. The degree of correspondence between an individual's skills and abilities with the ability requirements of the work environment will predict satisfactoriness. In addition, the degree of correspondence between an individual's needs and values and the reinforcers available in the work environment will predict satisfaction with work. Dawis and Lofquist summarized the TWA as follows:

· Work is conceptualized as an interaction between an individual and a work environment.

· The work environment requires that certain tasks be performed, and the individual brings skills to perform the tasks.

· In exchange, the individual requires compensation for work performance and certain preferred conditions, such as a safe and comfortable place to work.

· The environment and the individual must continue to meet each other's requirements for the interaction to be maintained. The degree to which the requirements of both are met may be called *correspondence*.

· Work adjustment is the process of achieving and maintaining correspondence. Work adjustment is indicated by the satisfaction of the individual with the work environment and by the satisfaction of the work environment with the individual (that is, the individual's *satisfactoriness*).

· Satisfaction and satisfactoriness result in tenure, the principal indicator of work adjustment. Tenure can be predicted from the correspondence of an individual's work personality with the work environment.

· Work personalities and work environments can be described in terms of structure and style variables that are measured on the same dimensions (Dawis & Lofquist, 1984, pp. 9-10).

To completely operationalize the TWA, one must measure characteristics of both the individual and the work environment to determine the amount of correspondence between the two. The TWA considers both abilities and vocational needs to be instrumental characteristics of individuals that are relevant to determine the correspondence between the individual and work environment. Two measurement tools had been designed specifically to measure the abilities and needs of individuals relevant for the individual-work environment relationship: the General Aptitude Test Battery (GATB; U.S. Department of Labor, 1970), which measures workers'work-related abilities; and the MIQ (Rounds et al., 1981), which measures workers'needs and values. Complementary to the ability and need characteristics of individuals, are the ability requirements and reinforcer systems of work environments. To assess the degree of correspondence between the needs of an individual and the reinforcer systems of occupational environments, a third measurement tool, the Minnesota Job Description Questionnaire (MJDQ; Borgen, Weiss, Tinsley, Dawis & Lofquist, 1968), is necessary for measuring ORPs. The MJDQ provides a description of the work environment in need/value terms. The need-reinforcer statements included in the MJDQ are very similar to the statements included in the MIQ (Dawis & Lofquist, 1984) to enable the individual's needs/values to be matched to what the work environments provide in terms of need and value satisfaction or fulfillment. To assess the ability requirements of jobs, a fourth tool, job analysis, is used (specifically, job analysis tools yielding job profiles compatible with worker ability profilers like the GATB). The MIQ and the MJDQ are described below in greater detail.

# The Minnesota Importance Questionnaire (MIQ)

The MIQ was based on the N-Factors Questionnaire, which in turn was based on a questionnaire by Schaffer (1953). The MIQ has been through three revisions since its creation in 1964. It is designed to provide information about an individual's needs and values. Persons completing the MIQ are asked to indicate the relative importance, to them, of 21 vocationally relevant need reinforcers (e.g., receiving recognition, having steady employment). The need-reinforcer dimensions measured by the MIQ have been found to be important to job satisfaction (Gay, Weiss, Hendel, Dawis & Lofquist, 1971). The 21 needs can be grouped into 6 value dimensions (derived through factor analysis) named Achievement, Comfort, Status, Altruism, Safety, and Autonomy (though these names were later changed in the O*NET tools to Achievement, Working Conditions, Recognition, Relationships, Support and Independence - for elaboration see McCloy, Waugh, Medsker, Wall, Rivkin and Lewis, 1999B).

The original form of the MIQ consisted of 20 scales of 5 items each. Respondents were asked to rate the importance of specific aspects of work on a 5-point Likert scale. This form produced negatively skewed distributions of scale scores and yielded high intercorrelations among scale scores (Gay et al., 1971). Ipsative forms of the MIQ, including a paired-comparison form and a multiple ranking form, were developed to overcome these deficiencies.

The Multiple Rank Order 5 (MR05) version of the MIQ was the basis for the WIP-C. The MR05 produced scores for 21 needs. Related needs are combined into six work values scales. According to the TWA, needs and values with high scores are important to a person's satisfaction; needs and values with low scores have little or no effect upon a person's satisfaction. For example, the level of Independence inherent in a specific job will greatly affect the satisfaction of people who have high scores on the Independence need of the MIQ, but it will have little effect on people who have low scores.

The multiple ranking form (MR05) consists of two sections: a ranked section and an absolute zero section. In the ranked section, stimuli are grouped into a *balanced incomplete block* in which each stimulus is paired with every other stimulus an equal number of times. The 21 statements are presented in 21 blocks. Each block has five statements. Within each block, respondents rank-order the statements according to the relative importance of the needs on their ideal jobs. Each need appears in five blocks and with every need exactly once. Using this format, 210 paired comparisons can be reduced to 21 blocks of 5 stimuli each. This format produces profiles similar to those provided using the paired-comparison form, and reduces administration time and the number of judgments required of respondents (Rounds, Miller, & Dawis, 1978).

The responses in this first part of the MIQ indicate the *relative* importance of the 21 needs. That is, the scoring thus far is ipsative. The scores do not show the *absolute* importance of each need. For some people, however, only a few needs are important; for others, most needs are important. Therefore, the second part of the MIQ asks the respondents to rate each need as either *important or not important*. This places each need on an absolute scale. Possible scores range from -4.00 to +4.00, although each *person's* scores will have a range no greater than 4.00.

Because each need appears in five different blocks, a respondent's consistency can be computed. The following example demonstrates inconsistent responding: Need A is ranked higher than Need B, Need B is ranked higher than Need C, and Need C is ranked higher than Need A. This is called *a circular triad*. Within the MIQ, there are 440 triads of needs. For the MIQ, the percentage of circular triads (PCT) is computed as the percentage of the 440 triads that are circular. The converse of this statistic is the *coefficient of consistency*, which is the proportion of triads that are *not* circular. If the coefficient of consistency is less than .50, then it is assumed that the respondent is either responding carelessly or is unsure of the importance of his or her needs. Score results for the MIQ include scores on the 21 needs, scores on the six values, and the percentage of circular triads (Rounds et al., 1978).

### Minnesota Job Description Questionnaire (MJDQ)

Whereas the MIQ examines the person side of work values, the MJDQ (Borgen et al., 1968) measures the occupational side. For a specific occupation, respondents rate how much each of 21 need statements describes the reinforcer characteristics of a specific occupation's work environment. These 21 statements involve the same 21 needs as used in the MIQ. The ORP profiles for occupations are based on the ratings of the supervisors or incumbents in those occupations. Ratings represent responses of immediate supervisors, employees, or mixed supervisor-employee groups. The scale used on the profiles ranges from -1.0 to +3.0. A unit of 1.0 equals one standard deviation. Positive scales indicate that the reinforcer statement is descriptive of the occupation. Profiles are also computed for each of the same six values used in the MIQ: Achievement, Comfort, Status, Altruism, Safety, and Autonomy (Stewart et al., 1986).

The values/needs rated highly in an ORP indicate the most salient features of the work environment which reinforce the satisfaction of workers' needs in that occupation. Work satisfaction is predicted for individuals whose needs and values correspond to the ORP for a given occupation. Dissatisfaction is predicted for those whose needs and values do not correspond to the ORP (Stewart et al., 1986).

Specific ORPs were published for 185 occupations in 1986 (Stewart et al.). These ORPs were presented based on the titles of the *DOT* (U.S. Department of Labor, 1965, 1977, 1991) and were linked to the codes and descriptions in the *DOT*. O*NET was developed to update the information and classification system on occupational titles and data incorporating the many changes in work environments (and new occupations developed in recent years). As O*NET matures, it will continue improving upon the precision and breadth of knowledge on occupations and work environments. In conjunction with the change from the *DOT* to the O*NET, it is also

recognized that the earlier ORPs must also be updated to reflect changing occupations and work environments. Thus, the purpose of Part III of this project was to develop ORPs on the recently developed OUs of O*NET.

The following chapters describe the research plan for developing the ORPs, the Pilot and Main Studies that generated the ORPs for the 1,122 OUs, and recommendations for how the ORPs can help facilitate the use of O*NET for career exploration.

# Chapter 2. Overall Research Design for Developing the ORPs

## Introduction

This section discusses the overall research design for derivation of ORPs for the 1,122 OUs contained in O*NET.  The research plan comprises two primary research efforts: a) the generation of estimated ORPs using *DOT* data, and b) the SME study.  The former is discussed in detail in this section.  Also provided are summaries of the components of the SME study.  The SME study and its components are detailed in Chapters 3 and 4.

## Generating Estimated ORPs Using Regression

An initial attempt to develop ORPs involved generating regression equations that would yield estimated scores for each of the six Work Values dimensions (i.e., Altruism, Achievement, Autonomy, Comfort, Safety, Status).  Specifically, the procedure was to a) obtain a sample of jobs having work values scores, b) regress these scores on variables that measured important characteristics of the jobs, and c) evaluate the degree of relationship between the predicted and actual scores.  This regression study, which met with only moderate success, is described in some detail here.

Data for the study were collected by the University of Minnesota using the MJDQ.  Data were available for 185 jobs (i.e., *DOT* occupations), and 180 were retained for the study.  The five jobs removed from the analysis possessed duplicate *DOT* codes with other jobs that were retained.  For example, Accounting Clerk (civil service) and Accounting Clerk (manufacturing) each have the *DOT* code 216.482-010; the former was retained, but the latter dropped.  Information from 61 *DOT* variables was used to predict the observed ORPs.  The *DOT* variables were as follows:

· Data, People, Things

· Reasoning, Math, Language

· Specific Vocational Preparation (SVP)

· Physical Demands (*Strength, Climbing, Balance, Stooping, Kneeling, Crouching, Crawling, Reaching, Handling, Fingering, Feeling, Talking, Hearing, Tasting/Smelling, Near Acuity, Far Acuity, Depth Perception, Accommodation, Color Vision, Field of Vision*)

· Environment Conditions (*Exposure to Weather, Extreme Cold, Extreme Heat, Wet/Humid, Vibration, Atmospheric Conditions, Proximity to Moving Mechanical Parts, Exposure to Electrical Shock, Working in High Exposed Places, Exposure to Radiation, Working with Explosives, Exposure to Toxic/Caustic Chemicals, Other Environmental Conditions*)

- Temperaments (*Directing, Repetitive, Influencing, Variety, Expressing, Stress, Tolerances, Working Under specific instructions, People, Judgments*);

- GATB Aptitude Ratings (G, V, N, S, P, Q, K, F, M, I, C).

The first step was to reduce the number of *DOT* variables while retaining as much of the variance present in the scores as possible. A principal components analysis of the 61 *DOT* variables yielded a 13-component solution.

The next step was to regress each of the six work values dimensions on the 13 principal components scores. As had been done during a similar study that developed GATB score profiles for the OUs, 50 samples containing a randomly drawn 60 percent of the occupations (here, 108 occupations) were created. For each of the 50 samples, a regression equation was calculated for each of the six work values dimensions. Thus, for a given work values dimension, there were 50 estimates of the coefficient of determination ($R^2$), and each component score had 50 estimates of its dimension-specific regression coefficient. The mean $R^2$ values were respectable, with three of the values scores being predicted quite well (Achievement = .53, Altruism = .50, Autonomy = .62). More modest predictive relationships were observed for the remaining values scores (Comfort = .23, Safety = .34, Status = .34).

Each of the 50 sets of regression coefficients calculated on the 60-percent derivation sample was then applied to the remaining 40 percent ( $n = 72$ ) of the occupations in each respective holdout sample. In some instances, there was a rather drastic reduction in the $R^2$ values when the 60-percent sample weights were applied to the 40-percent sample: mean $R^2$ values ranged from .10 for Comfort to .54 for Autonomy. Because the derivation sample was based upon only 108 cases and the replication sample upon only 72 cases, sampling error had a rather powerful effect on the results.

Given the limited success of predicting work values scores, the original decision was to forego the use of estimated work values scores in lieu of scores derived from SMEs (here, the same group of judges who had provided ratings for many of the O*NET dimensions) during a separate, subsequent study (described in the next section). The work values ratings data, however, were called into question by USDOL staff during the course of the project. The primary source of concern was a cross tabulation of OUs by their top two work values scores that showed a sparse distribution of OUs in certain cells, thus indicating that there were few OUs having certain pairs of work values as the highest two work values. In particular, just 1 of the 1,122 OUs had Status as its highest work value (see Table 1). The validity of the ratings was, therefore, under scrutiny. As such, the estimated ORPs were revisited and compared to the ratings from the SME study. A similar cross tabulation based upon the estimated work values

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scores (Table 2), however, proved less satisfactory than those presented in Table 1.  The distribution of OUs was less desirable than that obtained using the SME ratings (i.e., there were more empty cells in the table, largely due to Achievement being the highest work value for 82 percent of the OUs when using the estimated scores).  Based on this findings, the estimated work values scores were dropped from further consideration.

*Table 1.* Cross Tabulation Showing the Highest Two Work Values for the OUs: Ratings from the SME Rating Study

| Highest Work Value | Second-Highest Work Value | | | | | | |
|---|---|---|---|---|---|---|---|
| | Achievement | Altruism | Autonomy | Comfort | Safety | Status | TOTAL |
| Achievement | NA | 44 | 155 | 59 | 31 | 5 | 294 |
| Altruism | 28 | NA | 10 | 29 | 88 | 0 | 155 |
| Autonomy | 132 | 6 | NA | 14 | 3 | 7 | 162 |
| Comfort | 374 | 9 | 9 | NA | 39 | 1 | 92 |
| Safety | 40 | 127 | 3 | 248 | NA | 0 | 418 |
| Status | 0 | 0 | 0 | 0 | 1 | NA | 1 |
| TOTAL | 234 | 186 | 177 | 350 | 162 | 13 | 1,122 |

*Table 2.* Cross Tabulation Showing the Highest Two Work Values for the OUs:  Estimated Scores from the Regression Equations

| Highest Work Value | Second-Highest Work Value | | | | | | |
|---|---|---|---|---|---|---|---|
| | Achievement | Altruism | Autonomy | Comfort | Safety | Status | TOTAL |
| Achievement | NA | 175 | 329 | 300 | 116 | 0 | 920 |
| Altruism | 33 | NA | 1 | 0 | 8 | 0 | 42 |
| Autonomy | 7 | 0 | NA | 0 | 0 | 0 | 7 |
| Comfort | 0 | 0 | 0 | NA | 3 | 0 | 3 |
| Safety | 68 | 19 | 0 | 63 | NA | 0 | 150 |
| Status | 0 | 0 | 0 | 0 | 0 | NA | 0 |
| TOTAL | 108 | 194 | 330 | 363 | 127 | 0 | 1,122 |

**Subject Matter Expert Study**

As just discussed, the results of the regression study led the project team to adopt an alternative approach that used trained raters to develop ORPs.

The generation of the judgment-based ORPs proceeded in the following phases: a) initial development of rating materials, b) a Pilot Study to verify that reliable profiles could be generated by non-incumbent raters, and c) a Main Study in which raters rated the 1,122 OUs, and their results were analyzed to examine rater reliability and to produce the ORPs. Each of these phases in the research design are discussed briefly below. Details of the phases are given in subsequent chapters.

## Development of Rating Materials

In this phase, occupationally anchored rating scales and other rater training materials were developed using the need statements from the MIQ as a basis. Rating scales were developed for each of the 21 work needs included in the MIQ and MJDQ. The primary difference in the use of the need statements in the MIQ, WIL-P&P, or WIP-C and these ORP rating items is the referent, the individual respondent is the referent for the need statement items on the WIP-C, WIL-P&P, and MIQ, and the job is the referent for the need statement items for the ORPs. The use of virtually identical items will make linking individual assessment results with occupational information straightforward. The ORPs can be used to explore the correspondence between an individual's work values, as derived from the score reports from the WIP-C or WIL-P&P, and the reinforcing qualities of different occupations. Anchor occupations indicative of high, moderate, or low potential for reinforcing the need expressed in each rating item were added to each item's rating scale to provide raters with additional guidance. Feedback received from Department of Labor programmers and staff on the rating materials was used to refine the rating scale before proceeding with the Pilot Study.

## Pilot Study of ORPs

The Pilot Study was conducted to see if the rating materials for the 21 need statements were understandable and to determine if improvements were needed. Another purpose of the Pilot Study was to see if raters who are not job incumbents could provide reliable judgments of the reinforcer patterns of the OUs in the O*NET. Nine industrial/organizational (I/O) psychology graduate students rated a representative sample of jobs. The resulting ORPs were compared to ORP profiles from the historical set of ORPs which had been published in 1986 -- and which had been based on incumbents' ratings of their own jobs (i.e., the data used in the regression study; Stewart et al., 1986).

**Main Study to Derive ORPs**

In the Main Study on ORPs, seventeen occupational analysts and I/O psychology graduate students were trained as raters to rate OUs on the 21 need statements. Each rater provided ratings for half of the 1,122 OUs of the O\*NET. Their ratings were analyzed to examine rater reliability and to produce the ORPs.

**Summary**

The research design for generating ORPs involved obtaining work values score profiles from two sources: a) regression equations that produced estimated work values scores and b) the SME study in which work values scores were derived from expert judgments of occupational analysts. The regression study met with limited success, providing good predictions for just three of the six work values. In addition, the distribution of "highest work values" across the 1,122 OUs was poor.

The SME study comprised three phases: a) initial development of materials for rating the ORPs of OUs, b) a Pilot Study to refine the materials and determine whether non-incumbent raters could provide reliable results, and c) a Main Study in which ORPs for the 1,122 OUs in the O\*NET were created based on their ratings on the 21 need statements. After comparing the characteristics of the two sets of work scores, the SME ratings data were selected as the basis for the ORPs. Initial development of the rating materials and results of the Pilot Study are presented in Chapter 3, and results of the Main Study on ORPs are presented in Chapter 4.

# Chapter 3. Pilot Study for ORP Rating Materials

## Introduction

This chapter discusses the development of the scales and materials for rating how well particular occupations reinforce workers'needs.  It also discusses the procedures and results of the Pilot Study conducted to refine the rating scales and assess the reliability of ratings from non-incumbent raters of occupations on the scales.

## Development of Rating Scales and Materials

Rating scales were developed for each of the 21 work needs using the needs measured in the MJDQ and MIQ.  The original wording of the 21 need statements was amended for several items during the O*NET project (see Table 3).  The O*NET wording was adopted for the Pilot Study rating scales.  Each rating scale was anchored with job titles found to be indicative of high, moderate, or low potential for reinforcing the need represented by the scale.  Specifically, the 185 jobs from the Stewart et al. (1986) data set were rank ordered on each need, and the top, middle, and lowest ranking job titles were considered as potential anchors.  Anchor occupations were chosen for each scale based on a) the likelihood that the job had not changed dramatically since the original ORPs were collected and b) the assumed level of familiarity that raters would be likely to have with the job title.  A set of the final rating scales appear in Appendix A.

While the rating scales were being assembled, several issues surfaced regarding the interpretation of the scales.  These issues were examined during rater training.  Most notably, the occupations anchoring the low end of the scales of some needs probably received low ratings not because adverse conditions existed in these occupations, but rather because there was little opportunity for the needs to be reinforced.  For example, the job title *Dentist* appears as a low anchor for the item, "To what extent are workers on this job treated fairly by the company?"The dentist job title is likely to be rated low on this item not because they are often treated unfairly, but rather because they typically do not work for companies; therefore, they lack the opportunity to be treated fairly or unfairly.  The concept that occupations could be placed at different points on the need scales based on the opportunity for need reinforcement was developed as a theme to be conveyed during training.

One scale, Moral Values, was not anchored with job titles because the item wording changed drastically between the Minnesota Job Description Questionnaire (MJDQ), used to collect ORPs in the Stewart et al. (1986) study, and the instruments used in the current research.  Rater training included an explanation of this problem and a discussion of how to best rate the occupations using the Moral Values scale.

Aside from the rating scales, a packet of rater-training materials was assembled that included an overview of the project, a summary of the Theory of Work Adjustment and its application, a document summarizing various types of rater errors, and a series of sample job descriptions to be rated.  Rater training materials are shown in Appendix B.

*Table 3.* WVP Wording Changes from the O*NET Project

| WVP | Original MIQ Items | Reasons for Changes Made |
|---|---|---|
| 1. On my ideal job it is important that <u>I make use of my abilities</u>.[1] | 2. On my ideal job it is important that <u>I could do something that makes use of abilities</u>. | MIQ/MJDQ nonparallel. Follow MJDQ and O*NET |
| 3. On my ideal job it is important that the <u>work</u> could give me a feeling of accomplishment.[1] | 4. On my ideal job it is important that the <u>job</u> could give me a feeling of accomplishment. | Work consists of tasks that are done on a job. It is more clear and less redundant |
| 5. On my ideal job it is important that I could be busy all the time. | 6. On my ideal job it is important that I could be busy all the time. | |
| 7. On my ideal job it is important that the job would provide an opportunity for advancement. | 8. On my ideal job it is important that the job would provide an opportunity for advancement. | |
| 9. On my ideal job it is important that <u>I could give directions and instructions to others</u>.[2] | 10. On my ideal job it is important that <u>I could tell people what to do</u>. | Consistent with O*NET |
| 11. On my ideal job it is important that <u>I would be treated fairly by the company</u>.[2] | 12. On my ideal job it is important that <u>the company would administer its policies fairly</u>. | Consistent with O*NET |
| 13. On my ideal job it is important that my pay would compare well with that of other workers. | 14. On my ideal job it is important that my pay would compare well with that of other workers. | |
| 15. On my ideal job it is important that my co-workers would be <u>easy to get along with</u>.[2] | 16. On my ideal job it is important that my co-workers would be <u>easy to make friends with</u>. | Consistent with O*NET |
| 17. On my ideal job it is important that I could <u>try out my own ideas</u>.[1] | 18. On my ideal job it is important that I could <u>try out some of my own ideas</u>. | MIQ/MJDQ items non-parallel. Follow MJDQ wording. |
| 19. On my ideal job it is important that I could <u>work alone</u>.[1] | 20. On my ideal job it is important that I could <u>work alone on the job</u>. | Reduce redundancy |
| 21. On my ideal job it is important that I would never <u>be pressured to do things that go against my sense of right and wrong</u>.[3] | 22. On my ideal job it is important that <u>I could do the work without feeling that it is morally wrong</u>. | Consistent with O*NET |
| 23. On my ideal job it is important that I could <u>receive</u> recognition for the work I do. [1] | 24. On my ideal job it is important that I could <u>get</u> recognition for the work I do. | O*NET change MIQ/MJDQ items non-parallel. Follow MJDQ wording |

*Table 3*.  WVP Wording Changes from the O*NET Project (continued)

| WVP | Original MIQ Items | Reasons for Change Made |
|---|---|---|
| 1.  On my idea job it is important that I could make decisions on my own. | 2.  On my ideal job it is important that I could make decisions on my own. | |
| 3.  On my ideal job it is important that the job would provide for steady employment. | 4.  On my ideal job it is important that the job would provide for steady employment. | |
| 5.  On my ideal job it is important that I could do things for other people. | 6.  On my ideal job it is important that I could do things for other people. | |
| 7.  On my ideal job it is important that I would be looked up to by others in my company and my community. [2] | 8.  On my ideal job it is important that I could be "somebody" in the community. | Consistent with O*NET |
| 9.  On my ideal job it is important that I have supervisors who would back up their workers with management. [1] | 10.  On my ideal job it is important that my boss would back up the workers (with top management). | Consistent with O*NET |
| 11.  On my ideal job it is important that I would have supervisors who train workers well. [1] | 12.  On my ideal job it is important that my boss would train their workers well. | Consistent with O*NET |
| 13.  On my ideal job it is important that I could do something different every day. | 14.  On my ideal job it is important that I could do something different every day. | |
| 15.  On my ideal job it is important that the job would have good working conditions. | 16.  On my ideal job it is important that the job would have good working conditions. | |
| 17.  On my ideal job it is important that I could plan my work with little supervision. | 18.  On my ideal job it is important that I could plan my work with little supervision. | |

[1]Minor difference in the wording between WVP and MIQ.
[2]Moderate difference in the wording between WVP and MIQ.
[3]Substantial difference in the wording between WVP and MIQ.

## Pilot Study Procedure

A Pilot Study of the rating materials was conducted to verify that reliable profiles could be generated by non-incumbent raters and to estimate the number of raters that would be required to obtain ORPs for all 1,122 OUs.  A total of nine I/O psychology graduate students participated in the Pilot Study and rated a representative sample of a) jobs that had been assigned ORPs in the Minnesota work (Stewart et al., 1986), and b) OUs from the O*NET.  The data from the pilot study were analyzed to determine the reliability of the ratings.  Comparisons were also made between the estimated ORP profiles (using the graduate students as expert judges) and the actual ORP profiles in the Minnesota data (which used incumbents).

Each rater received a definition of each of 30 OUs/occupations and a list of its representative tasks.  This same material had been previously supplied to the raters when they generated O*NET ratings during the DOT conversion project.  The judges rated each OU/occupation on all 21 needs before moving to the next OU/occupation.

Other materials provided to judges during the pilot study included a) a familiarity rating form (the judges rated their familiarity with the OUs/occupations to be rated), b) OU/occupation definitions, and c) rating forms (on which judges recorded their ratings and the time required to rate each block of five OUs/occupations).

With the above data, the pilot study provided estimates of the overall time required to make the ratings.  This information, along with the results from the reliability analyses, was used to plan the staffing of the actual expert judgment task.

## Pilot Study Results

Results from the Pilot Study showed that $k$-rater reliabilities ranged from .53 to .96 across the OUs/occupations.  (Interrater reliability was computed using $ICC(3, k)$ of Shrout and Fleiss (1979), which is equivalent to Cronbach's alpha with $k$ = number of raters.)  Only three OUs/occupations had reliabilities below .75, and the median reliability was .86.  In addition, the ORPs generated by the judges for the OUs/occupations generally corresponded closely to the Minnesota ORP profiles.  The correlations between the profiles in the current study versus the Minnesota profiles ranged from .12 to .92, with most being greater than .50.  In addition, the time estimates indicated that all raters could rate an OU/occupation in less than six minutes. The $k$-rater reliabilities were apparently not affected by the judges'familiarity with the OU/occupation or by the type of stimulus being rated (i.e., an occupation or an OU).

### Application of the Results to Planning for the Main Study on ORPs

Rater reliabilities from the Pilot Study were used to estimate the minimum number of raters required for the operational study. This estimate was made by identifying an OU that yielded a reliability near the median value (.86) and then estimating the single-rater reliability estimate with the Spearman-Brown formula (Ghiselli, Campbell, & Zedeck, 1981) for the OU. The single-rater reliability estimate was then used in the formula provided by Shrout and Fleiss (1979) to determine the minimum number of raters required to achieve at least a *k*-rater reliability of .80. (The lower figure of .80 rather than .86 was used in case there was some rater dropout). This process indicated that at least six raters would be required for each OU.

The Pilot Study yielded one additional finding: raters expressed some confusion over the rating scale for the Compensation need. The item reads, "To what extent are workers on this job paid well in comparison with other workers?" Raters in the Pilot Study requested more information regarding the comparison point for the item. After consultation with Dr. René Dawis, the Work Values project's principal scientist, it was decided to have raters make the judgment with reference to workers with similar levels of training and education. For example, an OU would be rated high if incumbents needed no training and only a high school diploma and were paid much more than incumbents in most other occupations that also required no training and only a high school diploma. This distinction was made during the training for the primary ORP study.

### Summary

Rating scales were developed to rate the extent to which the 21 needs measured by the MJDQ and MIQ are reinforced by various occupations. Anchor occupations were added to the rating scales to represent occupations that are high, medium, or low on the need reinforcer to assist raters in making judgments. After this initial development, a Pilot Study was conducted in which 9 non-incumbent raters (I/O psychology graduate students) rated 30 OUs/occupations on the 21 needs. Interrater reliabilities for all but three of the OUs/occupations rated were .75 or higher, indicating consistency among raters. In addition, most of the ORPs from this pilot study were correlated .50 or higher with ORPs for the same occupations published in 1986 (Stewart et al., 1986). The correlations included good consistency between incumbent raters who had rated the occupations more than 10 years ago and the non-incumbent raters used in this pilot, thus legitimizing the choice to use non-incumbents for this type of rating task. Additional information was gathered, and refinements were made to rater training and to the materials presented to raters in the Main Study. The next chapter discusses the procedures and results for this Main Study.

# Chapter 4.  Main Study: Deriving the ORPs

## Introduction

This chapter describes the procedures and results of the Main Study for deriving the ORPs for the entire set of 1,122 OUs in the O*NET.  Reliability results and ORP data are presented.

## Procedure

Seventeen occupational analysts and I/O psychology graduate students were trained to rate the extent to which each of 21 work needs was reinforced by each of 1,122 OUs.  The training was conducted in a one-day workshop using the materials prepared for the Pilot Study (see Appendices A and B).  The training session provided an overview of the project and emphasized the importance of the rating task.  Judges were trained on the use of the anchored rating scales, and a sample job was rated and discussed.  Finally, procedures for recording the ratings in an electronic data file were reviewed.  At the conclusion of the training session, all judges were provided with the materials required to complete the rating task on a computer disk.  The judges were provided with a short description of each OU and a list of the OUs commonly performed tasks.  The 1,122 OUs were split into two sets of 561 OUs (Set A and Set B).  Each judge was assigned one of the two OU sets and, therefore, rated each of the 21 needs for one-half of the OUs.  One judge dropped out of the study without providing any ratings; thus, eight judges rated each OU.  The OU ratings were completed over a five-week period.

## Results

Single-rater and $k$-rater reliabilities for each set of eight raters (i.e., $k = 8$ in this case) are summarized in Table 3.  All reliabilities were calculated using a model that assumes that raters are a fixed factor and that raters rate each object [i.e., $ICC(3, 1)$ and $ICC(3, k)$ from Shrout and Fleiss, 19798; $ICC(3, k)$ is equivalent to Cronbachs alpha].

Interrater reliability was assessed in two ways.  First, the agreement of the eight raters within Judge Group A (i.e., those who rated OUs in Set A) on the 21 needs for each of the 561 OUs was calculated.  In other words, agreement was assessed among the needs (i.e., within OU).  The interrater reliability of the eight raters was computed within the first OU using the 21 needs as rating targets.  Then, it was similarly computed within the second OU.  This process was repeated for all 561 OUs in OU Set A (i.e., using Judge Group A).  This resulted in 561 reliability coefficients, one for each OU.  The median of these 561 coefficients was computed, yielding a median interrater reliability within OU Set A.  This value (.83) is shown in the bottom section of Table 4 (*OUs* section of the table) in the row labeled *Median Reliability*.  The mean reliability was very similar (.81).  The same computations were done for OU Set B (i.e., using Judge Group B).  The resulting median reliability for OU Set B was .87 and the mean reliability was .85, as shown in Table 4.

*Table 4.* Occupation Reinforcer Ratings: Reliabilities for Needs and OUs.

| Target Object in Reliability Model | Single-Rater Reliabilities | | 8-Rater Reliabilities | |
|---|---|---|---|---|
| | Judge Group A | Judge Group B | Judge Group A | Judge Group B |
| **Needs (Items)** | | | | |
| 1. Ability Utilization | .60 | .67 | .92 | .94 |
| 2. Achievement | .56 | .59 | .91 | .92 |
| 3. Activity | .14 | .23 | .57 | .70 |
| 10. Independence | .36 | .35 | .82 | .81 |
| 19. Variety | .44 | .44 | .86 | .86 |
| 7. Compensation | .31 | .43 | .78 | .86 |
| 14. Security | .28 | .35 | .76 | .81 |
| 20. Working Cond. | .49 | .59 | .89 | .92 |
| 4. Advancement | .23 | .30 | .70 | .77 |
| 12. Recognition | .46 | .54 | .87 | .90 |
| 5. Authority | .62 | .61 | .93 | .93 |
| 16. Social Status | .58 | .56 | .92 | .91 |
| 8. Co-Workers | .37 | .23 | .83 | .71 |
| 11. Moral Values | .39 | .39 | .84 | .83 |
| 15. Social Service | .61 | .63 | .92 | .93 |
| 6. Co. Policy | .22 | .30 | .70 | .78 |
| 17. Supervision-HR | .23 | .28 | .70 | .76 |
| 18. Supervision-Tech. | .24 | .35 | .72 | .81 |
| 9. Creativity | .56 | .65 | .91 | .94 |
| 13. Responsibility | .47 | .61 | .88 | .93 |
| 21. Autonomy | .54 | .58 | .90 | .92 |
| Mean Reliability | .41 | .46 | .83 | .83 |
| Median Reliability | .44 | .44 | .86 | .86 |
| Range | .14–.62 | .23–.67 | .57–.93 | .70–.94 |
| **OUs** | | | | |
| Mean Reliability | .38 | .45 | .81 | .85 |
| 75th Percentile | .49 | .55 | .88 | .91 |
| Median Reliability | .37 | .46 | .83 | .87 |
| 25th Percentile | .29 | .38 | .76 | .83 |
| Range | .07–.67 | .08–.80 | .37–.94 | .42–.97 |
| Std. Dev. of Reliabilities | .13 | .13 | .10 | .08 |

The second method for assessing interrater reliability was a similar process performed to calculate the agreement of the eight judges in each of groups A and B on the 561 OUs for each of the 21 needs. In other words, agreement was assessed among the OUs (i.e., within each of the 21

needs). The 561 OUs in each set were the rating targets, instead of the 21 needs. Thus, one reliability coefficient was computed for each need for each of a set of eight judges across the 561 OUs rated by that set of judges. The process was then repeated for the other set of judges.

The reliability of one judge was estimated using the Spearman-Brown Prophecy formula (Ghiselli et al., 1981). Based on this analysis, the median and mean reliabilities for both Group A and Group B raters was .86 and .83, respectively (as shown at the bottom of the *Needs (Items)* section of Table 4).

The values in Table 4 and Table 5 (beginning on page 25) demonstrate that the raters provided profiles of adequate and acceptable reliability, with mean and median reliabilites in the .80s for both groups of raters. This indicates considerable consistency among the raters across both needs and OUs. The single-rater reliabilities obtained here surpassed those obtained from incumbents during the initial phase of the O*NET data collection.

Figure 1 shows the mean ORP profile of the 1,122 OUs rated in the current study. Figure 2 shows the ORP profiles from the current study (herein referred to as the ORP Study) along with incumbents'profiles from the early O*NET effort. This figure permits identification of differences between the mean profiles. To ensure that the profiles have approximately equal reliability, the comparison used only the 24 OUs/occupations that were rated by more than seven incumbents during the early O*NET data collection. Table 5 shows the number of raters in each group and statistics which compare the profiles of the O*NET and ORP rater groups. The $d^2$ statistic shows the sum of the squared differences of ratings for the two groups (the expected value of $d^2$ for a randomly selected pair of OUs is 18.8). The SumDiffs statistic shows the sum of the absolute differences of the ratings for the two groups (the expected value of SumDiffs for a randomly selected pair of OUs is 15.2). SumDiffs statistics larger than their expected values indicate less similarity in the profile ratings from the two groups of raters. Note that the O*NET incumbents, in some cases, judged two or more similar OUs as a unit rather than separately. Where this was the case, the subprofiles generated in the current study (denoted with a letter after the number of the OU) were averaged to form a mean profile (also shown in Table 5). Figure 2 plots the average of the profiles from the two rater groups.

Based on the comparison of profiles shown in Figure 2, it is evident that there is a tendency for incumbents to rate their jobs higher on each scale than the experts, and this corresponds to the common finding in the job analysis literature that incumbents tend to inflate their ratings. More detailed profile information (not shown in Figure 2 or Table 4) indicated that the needs related to the Achievement and Autonomy values showed the largest differences between the two sets of raters. It is not known whether these differences are due to incumbents inflating their ratings more in these areas, or whether the experts were less able to rate these two areas accurately. This is a question for future research. Generally, the experts showed moderate levels of agreement with the profiles generated by incumbents (the average correlation (*r*) between profile sets is .37 as shown at the bottom of Table 5). One should note, however, that because the profiles contain only 21 items, small deviations in the rank orders of the profiles can have large effects on the correlation between the profiles.

The agreement between the mean O*NET and ORP ratings was also measured in terms of matches between the top two work values. For 33 percent of the 24 OUs, the top work value was the same in O*NET and ORP ratings. For 17 percent of the OUs, the top two OUs were the same and in the same order. For 33 percent of the OUs, the top two were the same if the order between the top two was ignored.

## Summary

Seventeen occupational analysts and I/O psychology graduate students each rated the ORPs of 516 OUs. Raters provided profiles of adequate and acceptable reliability, with mean and median interrater reliabilities in the .80s. This indicates considerable consistency among raters in this study across both the needs and OUs, and higher reliabilities than those obtained from job incumbents during the initial phase of the O*NET data collection. The average correlation between need profiles from incumbent ratings and from ratings of judges in this study was .37; however, incumbents tended to rate their jobs higher on the needs in the initial O*NET data collection, which could be due to incumbents tendency to inflate ratings of their jobs. For 33 percent of the OUs, the top two needs were the same for the judges in this study as they were based on the information from job incumbents obtained in the O*NET research.

*Figure 1.* Mean ORP Rating for each Need (aggregating ratings for all OUs)
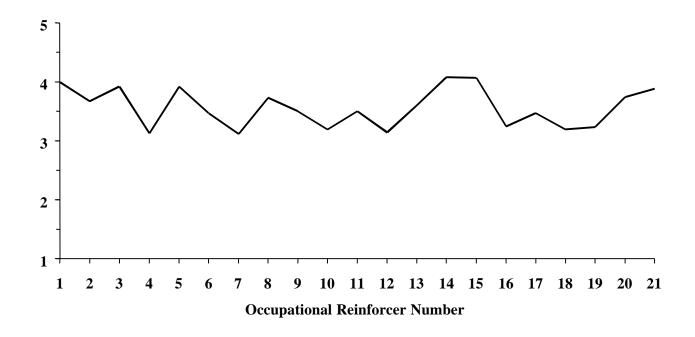
*Figure 2.* Mean ORP Profiles of Prior O*NET (incumbent raters) vs. SARDC (expert judges)
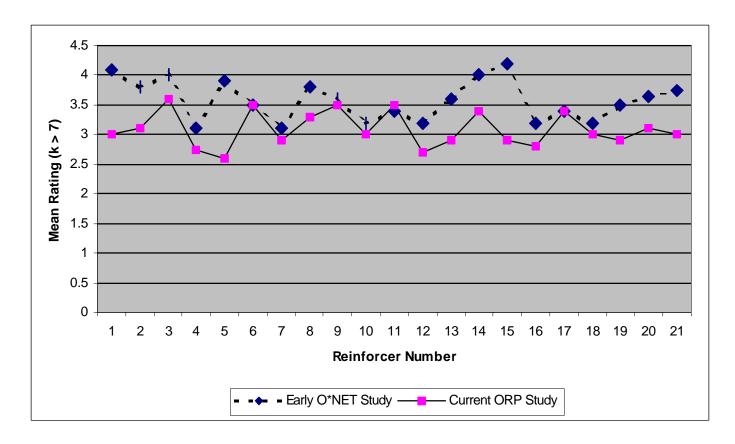
*Table 5.* Comparison Statistics for O*NET and ORP Study Profile Ratings

| OU | OU Title | Study | Raters | $d^2$ | SumDiffs | $r$ |
|---|---|---|---|---|---|---|
| 15005 | Education Administrators | O*NET | 11 \ | | | |
| | | | | 7.3 | 10.0 | 0.82 |
| 15005 | Mean of A and B | ORP Mean | 8 / | | | |
| 15005A | College and University Administrators | ORP | 8 | | | |
| 15005B | Educational Program and Directors | ORP | 8 | | | |
| 19005 | General Managers & Top Executives | O*NET | 43 \ | | | |
| | | | | 5.4 | 7.2 | 0.65 |
| 19005 | Mean of A and B | ORP Mean | 8 / | | | |
| 19005A | Government Service Executives | ORP | 8 | | | |
| 19005B | Private Sector Executives | ORP | 8 | | | |
| 22135 | Mechanical Engineers | O*NET | 11 \ | | | |
| | | | | 6.9 | 9.6 | 0.50 |
| 22135 | Mechanical Engineers | ORP | 8 / | | | |
| 31305 | Teachers, Elementary School | O*NET | 13 \ | | | |
| | | | | 6.9 | 10.1 | 0.77 |
| 31305 | Teachers, Elementary School | ORP | 8 / | | | |
| 32502 | Registered Nurse | O*NET | 26 \ | | | |
| | | | | 15.7 | 14.6 | 0.73 |
| 32502 | Registered Nurse | ORP | 8 / | | | |
| 49008 | Sales Representatives, Except Scientific and Related Products or Services and Retail | O*NET | 14 \ | | | |
| | | | | 8.2 | 10.0 | 0.22 |
| 49008 | Sales Representatives, Except Scientific and Retain Products or Services and Retail | ORP | 8 / | | | |

| OU | OU Title | Study | Raters | $d^2$ | SumDiffs | $r$ |
|---|---|---|---|---|---|---|
| 49011 | Salespersons, Retail | O\*NET | 21 \ | | | |
| | | | | 6.5 | 9.1 | 0.31 |
| 49011 | Salesperson, Retail | ORP | 8 / | | | |
| 49021 | Stock Clerks, Sales Floor | O\*NET | 13 \ | | | |
| | | | | 40.5 | 23.5 | -0.01 |
| 49021 | Stock Clerks, Sales Floor | ORP | 8 / | | | |
| 49023 | Cashiers | O\*NET | 20 \ | | | |
| | | | | 22.5 | 17.8 | 0.41 |
| 49023 | Mean of A and B | ORP Mean | 8 / | | | |
| 49023A | Cashiers, General | ORP | 8 | | | |
| 49023B | Cash Accounting Clerks | ORP | 8 | | | |
| 51002 | First Line Supervisors, Clerical & Adm. | O\*NET | 59 \ | | | |
| | | | | 2.6 | 5.1 | 0.68 |
| 51002 | Mean of A and B | ORP Mean | 8 / | | | |
| 51002A | First Line Supervisors, Customer Service | ORP | 8 | | | |
| 51002B | First Line Supervisors, Adm. Support | ORP | 8 | | | |
| 53905 | Teacher Aides and Educ. Assistants, Clerical | O\*NET | 9 \ | | | |
| | | | | 20.4 | 17.2 | 0.26 |
| 53905 | Teacher Aides and Educ. Assistants, Clerical | ORP | 8 / | | | |
| 55108 | Secretaries, Except Legal and Medical | O\*NET | 67 \ | | | |
| | | | | 22.8 | 17.8 | 0.27 |
| 55108 | Secretaries, Except Legal and Medical | ORP | 8 / | | | |

Table continued....*Table 5*. Comparison Statistics for O*NET and ORP Profile Ratings (continued)

| OU | OU Title | Study | Raters | $d^2$ | SumDiffs | $r$ |
|---|---|---|---|---|---|---|
| 55338 | Bookkeeping, Accounting & Auditing Clerks | O*NET | 27 \ | | | |
| | | | | 10.6 | 12.3 | 0.21 |
| 55338 | Mean of A and B | ORP Mean | 8 / | | | |
| 55338A | Bookkeepers | ORP | 8 | | | |
| 55338B | Accounting Clerks | ORP | 8 | | | |
| | | | | | | |
| 55347 | General Office Clerks | O*NET | 92 \ | | | |
| | | | | 15.1 | 13.8 | 0.02 |
| 55347 | General Office Clerks | ORP | 8 / | | | |
| | | | | | | |
| 61005 | Police and Detective Supervisors | O*NET | 13 \ | | | |
| | | | | 5.9 | 9.9 | 0.64 |
| 61005 | Police and Detective Supervisors | ORP | 8 / | | | |
| | | | | | | |
| 63014 | Police Patrol Officers | O*NET | 24 \ | | | |
| | | | | 8.7 | 11.2 | 0.47 |
| 63014 | Mean of A and B | ORP Mean | 8 / | | | |
| 63914A | Police Investigators-Patrollers | ORP | 8 | | | |
| 63014B | Highway Patrol Pilots | ORP | 8 | | | |
| | | | | | | |
| 65008 | Waiters & Waitresses | O*NET | 11 \ | | | |
| | | | | 32.7 | 22.4 | 0.52 |
| 65008 | Mean of A and B | ORP Mean | 8 / | | | |
| 65008A | Waiter/Waitress | ORP | 8 | | | |
| 65008B | Wine Steward/Stewardess | ORP | 8 | | | |
| | | | | | | |
| 65038 | Food Preparation Workers | O*NET | 31 \ | | | |
| | | | | 37.7 | 25.0 | 0.30 |
| 65038 | Mean of A and B | ORP Mean | 8 / | | | |

Table continued....*Table 5*. Comparison Statistics for O\*NET and ORP Profile Ratings (continued)

| OU | OU Title | Study | Raters | $d^2$ | SumDiffs | $r$ |
|---|---|---|---|---|---|---|
| 65038A | Food Preparation Workers | ORP | 8 | | | |
| 65038B | Kitchen Helpers | ORP | 8 | | | |
| 66008 | Nursing Aides, Orderlies, and Attendants | O\*NET | 21 \ | | | |
| | | | | 20.3 | 16.9 | 0.51 |
| 66008 | Nursing Aides, Orderlies, and Attendants | ORP | 8 / | | | |
| 67005 | Janitors and Cleaners, Except Maids and Housekeeping Cleaners | O\*NET | 29 \ | | | |
| | | | | 48.3 | 28.1 | 0.13 |
| 67005 | Janitors and Cleaners, Except Maids and Housekeeping Cleaners | ORP | 8 / | | | |
| 85132 | Maintenance Repairers, General Utility | O\*NET | 26 \ | | | |
| | | | | 20.3 | 17.2 | -0.01 |
| 85132 | Maintenance Repairers, General Utility | ORP | 8 / | | | |
| 92974 | Packaging and Filling Machine Operators and Tenders | O\*NET | 15 \ | | | |
| | | | | 26.0 | 20.3 | 0.07 |
| 92974 | Packaging and Filling Machine Operators and Tenders | ORP | 8 / | | | |
| 97102 | Truck Drivers, Heavy or Tractor Trailer | O\*NET | 9 \ | | | |
| | | | | 24.0 | 16.8 | 0.26 |
| 97102 | Mean of A and B | ORP Mean | 8 / | | | |
| 97102A | Truck Drivers, Heavy | ORP | 8 | | | |
| 97102B | Tractor-Trailer Truck Drivers | ORP | 8 | | | |

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Table continued....*Table 5.* Comparison Statistics for O*NET and ORP Profile Ratings (continued)

| OU | OU Title | Study | Raters | $d^2$ | SumDiffs | $r$ |
|---|---|---|---|---|---|---|
| 97111 | Bus Drivers, School | O*NET | 11 \ | | | |
| | | | | 26.0 | 21.2 | 0.05 |
| 97111 | Bus Drivers, School | ORP | 8 / | | | |
| | | Mean==> | | 18.4 | 15.3 | 0.37 |

*Note*: The expected values of $d^2$ and SumDiffs are 18.8 and 15.2, respectively, for a randomly selected pair of OUs.

$d^2$ = sum of the squared differences between the O*NET ratings and the ORP ratings for each need.

SumDiffs = sum of the absolute differences between the O*NET ratings and the ORP ratings for each need.

$r$ = the correlation between the O*NET and ORP profiles.

# Chapter 5.  Summary and Conclusions

## Summary

This report has detailed the development of the Occupational Reinforcer Patterns (ORPs) for the 1,122 Occupational Units (OUs) of the Occupational Information Network (O*NET) database. Two other reports describe the development of the computerized Work importance profiler (WIP-C; please see McCloy, Waugh, Medsker, Wall, Rivkin and Lewis 1998C) and the paper-and-pencil Work importance profiler (WIL-P&P; please see McCloy, Waugh, Medsker, Wall, Rivkin and Lewis 1998A) that were also components of the Work Values project sponsored by USDOL.

ORPs are profiles of scores on need statements that characterize the content of work (e.g., authority, creativity) and conditions of the work environment (e.g., compensation, advancement potential) in occupations.  ORP's are based on ratings of the presence or absence of the need reinforcers in specific occupations.  Clients with score profiles from one of the two work importance profilers (WVPs) use the ORPs as their basis of comparison: OUs having ORPs that most closely correspond with their WVP score profile are targeted as promising avenues for further career exploration.

The research design for generating ORPs involved obtaining work values score profiles from two sources: a) regression equations that produced estimated work values scores, and b) an SME (Subject Matter Expert) study in which work values scores were derived from expert judgments of occupational analysts.  The regression study met with very limited success, yielding equations that accurately estimated scores for just three of the six work values.  The SME study comprised three phases: a) initial development of materials for rating the ORPs or OUs, b) a Pilot Study to refine the materials and determine whether non-incumbent raters could provide reliable results, and c) a Main Study in which ORPs for the 1,122 OUs in the O*NET were created based on their ratings on the 21 need statements.  Concerns over the validity of the expert judgments from the SME study spurred a subsequent comparison of the ORPs generated by the regression and SME studies.  After comparing the characteristics of the two sets of work values scores (e.g., the distribution of OUs in terms of their highest two Work Values), the SME ratings data were selected as the basis for forming ORPs.

During the SME study, occupationally anchored rating scales were developed for judges to rate the extent to which the 21 needs measured by the MJDQ and MIQ are reinforced by various occupations.  A Pilot Study in which nine non-incumbent raters (I/O psychology graduate students) rated 30 OUs/occupations on the 21 needs demonstrated that (a) raters using the rating scales could provide reliable ratings, and (b) the judges provided ORPs that correlated .50 or higher with ORPs for the same occupations published in 1986 (Stewart et al., 1986).

In the Main Study, 17 occupational analysts and I/O psychology graduate students each rated the ORPs of 516 OUs.  Raters provided profiles of adequate and acceptable reliability, with mean and median interrater reliabilities in the .80s.  The average correlation between need profiles from incumbents and from SMEs was .37, with incumbents rating their jobs higher on the needs.  For 33 percent of the OUs, the top two needs were identified by SMEs and incumbents.

## Conclusions

The work values project produced reliable, valid measures of work values and occupation profiles of value scores (ORPs). Two methods of producing ORPs (one empirical, one rational) were investigated. The data obtained from these investigations strongly supported the use of the SME ratings of work values scores for the 1,122 OUs that will appear in the O*NET. For example, ORPs generated by the SMEs evidenced appreciable reliability, respectable correlation with profiles obtained by job incumbents, and reasonable patterns of work values scores across OUs.

One other advantage of the SME ORPs should be noted. The SMEs provided work values ratings based upon the capacity of each OU to reinforce a given need in today's job market. The estimated work values scores provided by the regression equations, however, were grounded in the somewhat dated *DOT* information (recall that the predictor variables were the 13 component scores resulting from a components analysis of 61 *DOT* variables). Therefore, ORPs based on the SME ratings can reflect changes in the reinforcing characteristic of occupations that may have occurred over the past decade. Given the dynamism of the workplace during this time period, a continuing shift to service occupations and 'knowledge work,' less job security (e.g., organizational downsizing), fewer job benefits, the changing nature of organizations (e.g., smaller, flatter, shorter product cycles, more outsourcing), the SME ratings have the greater potential validity.

Although the work values data have often been reported at the level of the six values rather than the 21 needs, the ORPs for the OUs for the O*NET career exploration tools retain the need-level information. Data obtained from the psychometric studies of the two work values measures indicated that the 21 needs did not fit as neatly into the six values as they might have at one time. Much of this disparity appears due to wording changes in the items that were incorporated during the development of the O*NET. Using all 21 need scores in the ORPs increases the capacity of fine discriminations among OUs for a given client's work values profile.

Comparing client/OU profiles at the level of the needs could be particularly useful for clients having prior job experience, because these individuals might not be seeking an increase in the reinforcement of a work value as much as in the satisfaction of a specific need. Indeed, work values measures are typically more helpful for experienced clients, as the complaints of experienced employees typically are couched in terms of work values (e.g., insufficient pay, lack of promotion opportunities, lack of support from upper management).

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