

Technical Report 1237

**Evaluating the O*NET Occupational Analysis System
for Army Competency Development**

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July 2008



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EVALUATING THE O*NET OCCUPATIONAL ANALYSIS SYSTEM FOR ARMY COMPETENCY DEVELOPMENT

EXECUTIVE SUMMARY

Research Requirement:

The Quadrennial Defense Review (2006) called for an “in depth study of the competencies U.S. forces require and the performance standards to which they must be developed” (p. 80). The Department of Labor’s (DOL) occupational information database (O*NET; Peterson, Mumford, Borman, Jeanneret, & Fleishman, 1999) provides a logical starting point for identifying the structure and composition of an occupational database that will meet the Army’s needs. Indeed, the Army has previously commissioned a brief concept paper on just this issue (Russell, Mumford, & Peterson, 1996) as well as a more far-reaching review of the O*NET and occupational analysis in general (Committee on Techniques for the Enhancement of Human Performance: Occupational Analysis, 1999). Continuing this reasoned approach, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) initiated this project to evaluate the utility of O*NET for describing Army occupation competencies.

Procedure:

The present evaluation focused primarily on the usefulness of the O*NET system for Army occupational analysis *for selection and classification purposes*. The O*NET, which is organized around a content model, contains a wealth of data, and evaluating all of O*NET for all possible human resource needs would be beyond the scope of this effort. The evaluation focused on the appropriateness of O*NET descriptors that would typically be used in an Army occupation analysis for selection and classification purposes. These included abilities, skills, Generalized Work Activities [GWAs], and work context.

The evaluation was designed to address the following six questions:

1. Are Army occupations rated reliably using O*NET rating scales?
2. Do ratings on O*NET rating scales differentiate Army occupations?
3. How well do Subject Matter Expert (SME) and analyst ratings agree?
4. Are ratings on Army occupations similar in quality to ratings on civilian occupations?
5. Are Army occupational profiles similar to those for their civilian counterparts?
6. How well do O*NET’s work requirements descriptors, particularly generalized work activities (GWAs), cover Army job requirements?

Addressing the first five questions required collection of ratings on the selected O*NET descriptors—abilities, skills, GWAs, and work context—for target Army occupations. Four civilian and four officer occupations were selected for this research. The objective was to produce data for the military occupations that could be compared to civilian O*NET data. Therefore, it was important to follow processes currently used by O*NET for data collection. In

effect, this meant collecting information on occupational tasks, abilities skills, GWAs, and work context from Army Subject Matter Experts (SMEs) and collecting ability and skill ratings using trained analysts.

SMEs were non-commissioned officers (NCOs) or officers with several years of experience in the Army and their occupations, and who thus had first-hand observation and experience of the focal occupations. Prior to SME workshops, we drafted lists of the major duties and Key Work Activities (KWAs) for their occupation. In the workshops, SMEs reviewed and finalized the occupation-specific materials and then rated O*NET abilities, skills, GWAs, and work context variables.

Two types of analysts were included in this research—O*NET analysts and project analysts. O*NET analysts were individuals who currently make operational ability and skill ratings for O*NET. Project analysts were HumRRO and ARI personnel who had prior experience with Army occupational analysis. O*NET trainers allowed us to collect our analyst data within the context of scheduled training and data collection for O*NET. O*NET and project analysts attended a 2 ½ day training session on rating abilities and skills. KWAs, GWAs, and work context ratings from the SME workshops served as stimulus materials for analysts to use in making their ratings.

The sixth question required somewhat different data. If O*NET GWAs appeared to be related to or “cover” all or many of the Army job requirements (called Major Duties (MDs)) that are common across occupations, then they would potentially be quite useful for providing a higher-order description of Army occupations (i.e., one that would encompass the major duties performed in the Army). If not, additions or revisions to the GWAs might be needed. In preparation for this assessment of coverage, we developed a major duties list based on prior research and obtained feedback on it from Army SMEs. To make this evaluation, we asked non-incumbent raters to rate the degree to which each MD was “covered” by each GWA, with no occupation specifically identified (i.e., the MD might be imagined to be a part of any of several occupations, no particular occupation was implicated).

Findings:

The O*NET analyst training package appears to work fairly well. Results presented in Chapter III suggest that trained analysts make reliable ability ratings. With some training, SMEs might do so as well, albeit SMEs are likely to take issue with the lack of Army-specificity in the anchors. We also found that trained project and O*NET analysts were able to rate the abilities with about the same level of agreement and reliability observed for O*NET analyst ratings of civilian occupations.

The ability level ratings show appropriate convergent and divergent validity for enlisted occupations. That is, the correlation between occupations on abilities was low relative to the correlations among different rater types. This suggests that the abilities would provide a useful basis for distinguishing jobs for classification purposes. We did, however, find that project analysts drew more distinctions than O*NET analysts. This suggests that trained analysts should be ones who know something about Army jobs. We also found that the abilities were less distinguishing for officer occupations, but it is possible that officer occupations are truly more

similar to each other than enlisted ones are, since officers have common responsibilities regardless of occupation.

Finally, we applied the multi-trait, multi-method approach to assess the convergence/divergence of O*NET ability data for Army occupations with O*NET ability data for civilian counterpart occupations in the O*NET database. We found that ability ratings for Army occupations correlated most highly with ability ratings for their civilian counterparts (mean $r = .73$); Army occupation ability ratings did not correlate as highly with ability ratings for non-counterpart civilian occupations (mean $r = .41$).

All rater types rated skills very reliably, and there were no large differences in the magnitude of ratings made by different rater types on skills. When all eight occupations were considered, the skill ratings showed differentiation across occupations. That differentiation diminished when we looked within enlisted and officer occupations, most of the differentiation probably resulting from differences between officer and enlisted occupation skill level requirements. Skill level means were considerably lower, on average, for entry-level enlisted jobs than for entry-level officers; it makes sense that higher levels of skills are more likely to come into play as Soldiers move up the ranks. As with the abilities, Army occupations were more highly correlated with counterpart civilian occupations on skills than non-counterpart occupations, another piece of evidence supporting skill rating validity.

While the empirical data for the work context variables were strong (e.g., SMEs rated them reliably, they differentiated jobs), verbal reports from the SME workshops suggested areas in which the work context descriptors might be improved. In particular, the work context descriptors could be helpful in describing in-garrison and deployment contexts—which were a frequent point of discussion in the workshops. Based on other comments from SMEs in the workshops, possible additions to the descriptor set include descriptions dealing with the following: work pace; sleep deprivation; communication with indigenous people, host nation counterparts, peers, and supervisors; travel, overseas travel, and extended time away from home; and lifting heavy weight.

The data suggest that if the Army were to collect GWA ratings from about 15 to 18 SMEs for each occupation, a recommended multi-rater reliability of .80 would be achieved. The data also suggest that those GWA ratings would differentiate occupations. The convergent correlations between Army occupations and *SOC* counterparts, in conjunction with the divergent correlations between Army and non-counterpart occupations, provide additional support for the convergent and divergent validity of the GWA ratings made by SMEs.

The task of assessing the coverage of MDs by GWAs showed that most MDs were covered by GWAs. Based on the criteria we imposed, 67 of the 87 MDs had “full” coverage, five had “High Partial” coverage, 11 had “low partial” coverage, and four were not covered. Interestingly, the 15 with low partial or no coverage were not necessarily Army-specific. We grouped them as follows: trades-related (e.g., install, maintain, and repair pipe assemblies), hazard/combat related (e.g., fire direct fire weapons), team-related (e.g., help peers and individual team members), and miscellaneous (e.g., prepare food and beverages).

Utilization and Dissemination of Findings:

The results of this study suggest that the rapid development and implementation of an Army-specific occupational analysis system is practicable using O*NET descriptors as a foundation. Recommendations include:

- Incorporate the ability and skill domains of O*NET “as is;”
- Make improvements by adding key descriptors to the O*NET GWAs and work context domains, as described in the final chapter;
- Develop and refine an Army-wide domain of Key Work Activities, organized into higher-order Major Duties;
- Use a cadre of trained analysts to make the ability and skill ratings (the standard O*NET training given to either experienced Army SMEs or Army scientists would be sufficient);
- Use samples of 15 to 30 SMEs to make the GWA and work context ratings for each Army occupation.

This system would provide an extremely useful “common language” occupational analysis system for the Army with strong links to the civilian occupational database. Such a link has obvious benefits for recruitment and rapid mobilization efforts. Selection and classification applications should flow directly from such a system as described in Campbell et al. 2006 and training and development needs could be met with a linkage of specific occupational tasks to KWAs and, hence, to Major Duties, as we briefly described in Chapter II. Opportunities for efficiencies in training and development applications would seem much easier to identify with such a system, as would the definition and development of job performance criteria linked to KWAs and MDs.

EVALUATING THE O*NET OCCUPATIONAL ANALYSIS SYSTEM FOR ARMY COMPETENCY DEVELOPMENT

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EVALUATING THE O*NET OCCUPATIONAL ANALYSIS SYSTEM FOR ARMY COMPETENCY DEVELOPMENT

I. Introduction and Purpose

“To compete effectively with the civilian sector for highly-qualified personnel to build the Total Force, the Department [of Defense] must possess both a modern human capital strategy and the authorities required to recruit, shape, and sustain the force it needs. The new Human Capital Strategy focuses on developing the right mix of people and skills across the Total Force. The Department’s Human Capital Strategy may be considered ‘competency-focused’ and ‘performance-based.’ It is based on an indepth study of the competencies U.S. forces require and the performance standards to which they must be developed. Each of the Military Departments will map the array of competencies and performance criteria that constitute its forces and also evaluate and improve personnel development processes to achieve those standards. Advancements, awards and compensation may then be linked to an individual’s performance rather than to longevity or time-in-grade. This will better align incentives to outputs and reward excellence” [*Quadrennial Defense Review Report (QDR)*, 2006, p. 80].

The QDR (2006) presents challenges and opportunities for Army occupational analysis. It presents an opportunity to develop a centralized, digitized occupational information system. Ideally, the system would be designed to provide occupational information that is easily accessible and well suited to the Army’s human resource management needs. One challenge has to do with the intent and language of the QDR. While it implies that the system would be used for training/development and compensation purposes, these and other uses are not fully articulated. The QDR uses the terms “competency-focused” and “performance-based” without defining them. There are several ways to interpret those terms; a wide range of work- and worker-oriented descriptors have been referred to as competencies in the literature (Sackett & Laczko, 2003).¹ Another challenge is that designing the information system will require research and innovation, and populating it will require time and effort. These challenges are surmountable, and meeting them could result in an Army occupational information database that is well worth the effort (Campbell, McCloy, Morton, Pearlman, Peterson, Rounds, & Ingerick, 2006).

The Department of Labor’s (DOL) occupational information database (O*NET; Peterson, Mumford, Borman, Jeanneret, & Fleishman, 1999) provides a logical starting point for identifying the structure and composition of an occupational database that will meet the Army’s needs. Indeed, the Army has previously commissioned a brief concept paper on just this issue (Russell, Mumford, & Peterson, 1996) as well as a more far-reaching review of the O*NET and occupational analysis in general (Committee on Techniques for the Enhancement of Human Performance: Occupational Analysis, 1999). Continuing this reasoned approach, the U.S. Army

¹ For the purposes of this project, we assume that “competency” is a broad term that refers to many types of job information. Where possible, we use the more specific terms “worker-oriented” characteristics (e.g., occupation-specific knowledge, abilities) and “work-oriented” descriptors (e.g., performance requirements, work/job context and machine-tools-equipment-technology).

Research Institute for the Behavioral and Social Sciences (ARI) initiated a contract to the Human Resources Research Organization (HumRRO) to evaluate the utility of O*NET for describing Army occupation competencies.

Purpose of the Project

The primary purpose of the project was to evaluate the usefulness of the O*NET system for Army occupational analysis. This is not a simple question, and it does not have a simple “yes” or “no” answer. Our objective was to identify descriptors from O*NET that are useful “as is” to the Army and those that should be modified, supplemented, or deleted altogether.

The evaluation was intended to speak to the QDR dictum that “each of the Military Departments will map the array of competencies and performance criteria that constitute its forces and also evaluate and improve personnel development processes to achieve those standards” (p. 80). This poses the question, would O*NET be sufficient, by itself, in describing Army occupations? If not, how is it insufficient and what are the remedies? Data collections and analyses were conducted to address these key questions.

Relevant History

*O*NET*

The U.S. Department of Labor (DOL) created O*NET in the 1990s to replace its predecessor, the *Dictionary of Occupational Titles (DOT)*. The *DOT* had originally been developed during the Great Depression as a way of providing standardized occupational information to public employment services—information that could be used to match occupation applicants to jobs (Dunnette, 1999). By 1945, the *DOT* contained 17,500 jobs organized into 550 occupational groups. The *DOT* was revised several times over the years, with the last revision occurring in 1991 (Dye & Silver, 1999).

While several data gathering methods were tried over the years, the philosophical underpinnings and methodological basis of the 1991 edition of the *DOT* still reflected “the work structure of mid-20th century America” (Dye & Silver, 1999, p. 11). Additionally, the time and expense involved in updating it had become prohibitive, and there were some concerns about the comprehensiveness of its descriptions. For these reasons, DOL formed the Advisory Panel on the Dictionary of Occupational Titles (APDOT), which recommended development of an occupational database and outlined a content model for it. First, a prototype O*NET database was developed on a sample of occupations (Peterson et al., 1991). Then, a series of efforts began to populate the database with descriptions of all 812 occupations in the *Standard Occupational Classification (SOC)*, (<http://www.bls.gov/soc/>). To ensure a controlled data collection and management process, occupational data have been collected in groups or “analysis cycles.”² Approximately 100 occupations have been included in each cycle. Cycle 9, which is currently underway, will complete the initial population of O*NET. Additional information about O*NET

² For a description of the O*NET Data Collection Publication Schedule, see www.onetcenter.org.

is available in the paper by Tsacoumis (2007), which appears in Appendix A, or at the O*NET website (<http://online.onetcenter.org/>).

It is worth pointing out that neither the *DOT* nor the O*NET included military occupations. However, some of the descriptor sets in O*NET are strongly tied to military research, particularly the O*NET abilities. Fleishman, Costanza, and Marshall-Mies (1999) cite a number of military studies conducted in the development and validation of the Abilities Requirements Taxonomy (Fleishman & Quaintance, 1984), which provided the basis for the O*NET abilities.

The Office of the Secretary of Defense (OSD) maintains a crosswalk between O*NET and military occupations. The Services provide information to OSD about military occupational codes. OSD assigns the Service occupation code (e.g., MOS) to a higher level occupational code and cross walks that code to the *SOC*. The Services provide information to OSD in various forms; there is not a standardized format for providing information (personal communication, Steve Reardon, 25 July 2007). Consequently, the crosswalk is based on broad occupational identifiers, not on occupation analysis data for occupational descriptors.

Army Occupational Analysis

The Army has a long history of conducting specific occupational analyses to serve the needs of training, selection, and classification. In the 1960s, the U.S. Total Army Personnel Command (PERSCOM) (currently the Human Resources Command) established the Occupational Analysis Program to assist in resolving Manpower, Personnel and Training (MPT) issues associated with the Army's role in Vietnam (Brady, 2004). Over the course of the war, the number of Military Occupational Specialties (MOS) had increased dramatically, and the Army needed occupation analysis data to assist in creating/merging MOS and identifying training requirements for them. In 1972, the Army adopted the Comprehensive Occupational Data Analysis Programs (CODAP) approach, pioneered by the Air Force Human Resource Laboratory in the late 1950s. CODAP is a collection of programs for processing task inventory data; it yields a series of standardized reports.

The next major change was in 1994 when the occupational analysis function moved from PERSCOM to ARI's new Occupational Analysis Office (OAO), where it resides today (Brady, 2004). ARI created the Occupational Data Analysis, Requirements, and Structure (ODARS) program to reduce turnaround time and flexibility in occupational analyses efforts. In this system ARI worked with the U.S. Army Training and Doctrine Command (TRADOC) schools to determine what tasks were performed; developed and administered a task survey; and organized, analyzed, and reported the data. The most recent and substantive change in ARI's OAO efforts has been a move to design an occupational analysis system that enhances the self-sufficiency of TRADOC schools and centers (Brady, 2004). ARI created a software package, the Automated Survey Generator (AUTOGEN), to develop, gather, analyze, and report occupational analysis information and implemented AUTOGEN in schools and centers. In this new model, ARI's OAO staff serves as expert advisors to the schools and resources for special projects. Additionally, ARI conducts occupation analyses for selection and classification purposes on a project-by-project basis.

In sum, the Army's current approach to job analysis is designed to meet training needs. Recently, the Army has desired improvements to selection and classification research, and to achieve those improvements new job analysis tools are needed (Campbell et al., 2006). Army recruits are classified into MOS based on their scores on the Armed Services Vocational Aptitude Battery (ASVAB)³; those scores are input into equations that estimate how well recruits are likely to perform in the MOS. These classification equations are derived from validity studies in which scores on predictors like the ASVAB are compared to job performance criteria. Having a meaningful and reliable criterion measure is a critical component for ensuring the success of classification research. Yet collecting criterion data for a sufficient number of jobs to meet the Army's classification research needs is laborious and expensive.

In 2006, the Army convened a panel of experts to make recommendations for how the Army should obtain criterion data in an ongoing fashion and ensure the transportability of validities within job families (Campbell et al., 2006). The panel concluded that a key component of the solution was to have a solid job analysis system. The panel articulated the design characteristics that would be highly desirable for an Army-specific system, and many of those features are key elements of O*NET. For example, the panel recommended that the Army job analysis system use a common language for describing similarities and differences in MOS and that it consist of cross-MOS descriptors as well as occupation-specific ones. Therefore, the evaluation of O*NET for describing Army jobs is an important step in the development of a job analysis system that can serve human resource functions other than training.

Overview of Approach

The present evaluation focused primarily on the usefulness of the O*NET system for Army occupational analysis *for selection and classification purposes*. That is, any occupational analysis system has utility only if it serves the purposes it is intended to serve (Society for Industrial and Organizational Psychology, Inc., 2003). The O*NET, which is organized around a content model, contains a wealth of data, and evaluating all of O*NET for all possible human resource needs would be beyond the scope of this effort. The O*NET content model is comprised of six domains, including: (a) worker characteristics (e.g., abilities, interests, work styles), (b) worker requirements (e.g., skills, knowledge, and education), (c) experience requirements (e.g., training), (d) occupation requirements (e.g., generalized work activities, work context), (e) workforce characteristics, and (f) occupation-specific information (e.g., tasks, tools, and technology). Within each content model domain, information is organized by different levels of description. We focused on the appropriateness of O*NET descriptors that would typically be used in an Army occupation analysis for selection and classification purposes. These included abilities, skills, generalized work activities [GWAs], and work context.

Our approach was designed to address the following six questions:

1. Are Army occupations rated reliably using O*NET rating scales?

³ Other factors such as the availability of training seats also influence classification assignments.

2. Do ratings on O*NET rating scales differentiate Army occupations?
3. How well do subject matter expert (SME) and analyst ratings agree?
4. Are ratings on Army occupations similar in quality to ratings on civilian occupations?
5. Are Army occupational profiles similar to those for their civilian counterparts?
6. How well do O*NET's work requirements descriptors, particularly GWAs, cover Army job requirements?

Addressing the first five questions required collection of ratings on the selected O*NET descriptors—abilities, skills, GWAs, and work context—for target Army occupations. Our plan was to produce data for the military occupations that could be compared to civilian O*NET data. Therefore, it was important to follow processes currently used by O*NET for data collection. For O*NET, job incumbents provide ratings on occupational tasks, skills, GWAs, and work context areas. Ability ratings for occupations are collected from trained analysts.⁴ Analysts have also been trained to rate skills, although until recently those data have been used only experimentally. Accordingly, we planned to collect skill, GWA, and work context data from SMEs for each target Army occupation. We planned to collect analyst ratings on the abilities and skills for target Army occupations, following the procedures used in collecting O*NET analyst ratings for SOC occupations (Donsbach, Tsacoumis, Sager, & Updegraff, 2003). In the O*NET analyst training, analysts rate occupations using a standard set of descriptive materials—tasks for the occupation and incumbents' ratings of those tasks, GWAs, and work context descriptors. To use a parallel approach in the evaluation, we needed to develop task lists for the target Army occupations. In sum, the plan required collecting task, skill, GWA, and work context ratings from SMEs and ability ratings from analysts. To allow comparison of SME and analyst data, we also asked SMEs to rate abilities and analysts to rate skills.

The sixth question required somewhat different data. If O*NET GWAs appeared to be related to or “cover” all or many of the Army job requirements that are common across occupations, here called Major Duties (MDs), then they would potentially be quite useful for providing a higher-order description of Army occupations (i.e., one that would encompass the major duties performed in the Army). If not, additions or revisions to the GWAs might be needed. In preparation for this assessment of coverage, we developed a major duties list based on prior research and obtained feedback on it from Army SMEs. To make this evaluation, we asked non-incumbent raters to rate the degree to which each MD was “covered” by each GWA, with no occupation specifically identified (i.e., the MD might be imagined to be a part of any of several occupations; no particular occupation was implicated).

Overview of Report

The remaining chapters of this report describe the procedures and results of the evaluation. In Chapter II, we describe the SMEs and analysts and the data collection efforts. Chapter III addresses questions 1-5 listed earlier through comparisons of intraclass correlation coefficients, convergent/discriminant analyses, and descriptive statistics. Chapter IV describes

⁴ The rationale here is that job incumbents are more likely to be familiar with the day-to-day duties and conditions of their jobs, while trained analysts are likely to be able to understand the ability constructs and make ability ratings (Tsacoumis, 2007).

the procedures and results of the evaluation of the GWAs against MDs, and Chapter V provides a discussion of the evaluation results.

II. Method of Describing Army Occupations Using O*NET

One key component of the evaluation was to examine how effectively different types of raters could use the O*NET descriptors to describe Army occupations. We included three different types of raters—Subject Matter Experts (SMEs), project analysts, and O*NET analysts.

- SMEs were NCOs or officers with several years of experience in the Army and their occupations, and who thus had first-hand observation and experience of the selected target occupations (described later in this chapter). Prior to SME workshops, we drafted lists of the major duties and key work activities (KWAs) for their occupation. In the workshops, SMEs reviewed and finalized the occupation-specific materials and then rated O*NET abilities, skills, GWAs, and work context variables.
- O*NET trainers allowed us to collect our analyst data within the context of scheduled training and data collection for O*NET. O*NET and project analysts attended a 2 ½ day training session on rating abilities and skills. KWAs, GWAs, and work context ratings from the SME workshops served as stimulus materials for analysts to use in making their ratings.
 - O*NET analysts are required to have at least two years of work experience, have completed two years of graduate education in a human resources related field, and have completed courses in job analysis and research methods. Of the 16 analysts who participated, all but one had participated in previous data collections for O*NET.
 - Project analysts were generally graduate-level trained psychologists with varying levels of experience in researching Army occupations. Seven of the eight analysts were HumRRO employees; one was a highly experienced occupational analyst from ARI.
- We sought eight raters of each type because O*NET researchers imposed a rule of eight analyst ability ratings for each occupation based on prior reliability studies.⁵ For interpretation of data in Chapter III, it is important to note that SMEs made ratings only for their target occupation, and, in the end, their numbers varied. The eight project analysts rated all target occupations. While 16 O*NET analysts participated in the research, each analyst only rated half of the target occupations. Therefore, there were eight O*NET analyst ratings for each occupation.

Given these backgrounds and procedures, the SMEs were likely to be more familiar with the target occupations, in view of their first-hand experience in them, but likely to have less context from which to make their ratings in terms of experience in other occupations or with the use of occupational analysis rating scales. On the other hand, the O*NET analysts have experience using standardized occupational information and the greatest familiarity with the specific occupational analysis scales used here, but the least first-hand knowledge and

⁵ Prior O*NET research suggested that eight raters would provide sufficient reliability for ability ratings (Donsbach et al., 2003).

experience with the focal occupations. The project analysts fall somewhere in between these two extremes.

This chapter describes the methods used to collect SME, project analyst, and O*NET analyst data⁶.

SME Data Collection Methods

Identification of Target Occupations

Identifying target occupations required balancing a number of competing concerns. We wanted jobs that were populous and had extant job analysis information that we could use as a starting point. We also wanted some jobs that were Army-specific and others that would have civilian counterparts. We needed to include both officer and enlisted jobs. Finally, this project was conducted during wartime, making accessibility of SMEs very difficult.

We made a list of a dozen or so occupations for possible study. Then, ARI worked with training schools for those occupations to determine accessibility of SMEs. In the end, four enlisted and four officer occupations were targeted. The officer occupations were counterparts to the enlisted ones. They were:

31A Military Police (Officer)
88A Transportation (Officer)
19A Armor (Officer)
25A Signal (Officer)

31B Military Police (Enlisted)
88M Motor Transport Operator (Enlisted)
19K M1 Armor Crewman (Enlisted)
25U Signal Support Systems Specialist (Enlisted)

Note that officer jobs are designated by a suffix of “A”. For selection and classification purposes, ARI typically needs job information on entry-level jobs (Skill Level 1 [SL1] enlisted; second lieutenant [2LT] officers). Therefore, our focus for the data collection was on entry-level job requirements.

Development of Key Work Activities and Major Duties

With help from ARI, we obtained as much information as possible about each occupation. Information sources included:

- Job analyses from prior ARI projects
- Job analyses conducted for training purposes through ARI’s Occupational Analysis group
- Soldier’s Training Manuals (STMs) and Field Manuals (FMs)
- Mission Training Plans (MTPs)
- Programs of Instruction (POIs)
- Officer Foundation Standards (OFS)
- Occupational information from similar civilian occupations (e.g., from O*NET)

⁶ It is also important to note that data collected for this project also served the needs of a complementary job analysis pilot study underway at ARI.

Not all sources were available for all occupations. For example, the OFSs were quite useful, but they are not available for all officer occupations.

We identified two types of occupational descriptors for development. The first type we termed key work activities (KWAs). These are less specific descriptions of work behavior than are job tasks. A KWA was defined as a statement describing a series or clustering of related behaviors a Soldier (or Officer) performs to achieve a specific work objective. KWAs were constructed to be as behaviorally homogeneous as possible. For example, “maintain individual weapon” and “aim and fire individual weapon” would be useful KWAs because they describe different types of behaviors. “Maintain and fire individual weapon” would not meet our criterion of behavioral homogeneity. We expected the KWAs to be occupation-specific, although some of them might be relevant to several occupations.

In contrast to KWAs, the second type of descriptor, major duties (MDs), consisted of broader statements intended to apply across occupations. A major duty was defined as a statement describing a definable and nontrivial duty, or responsibility, which a Soldier (or Officer) is accountable to perform, which has stakeholders to whom the results (i.e., outputs) are important and meaningful, and which entails work of significant complexity and duration. “Repair mechanical systems” and “drive wheeled vehicle” are examples of major duties. Specific guidelines for writing KWAs and MDs appear in Ingerick (2007).

We assigned staff to work with particular occupations and conduct training on writing the KWA statements. Staff members were told to first review all the source materials for their assigned occupation and to put the source materials in spreadsheets. Source materials were coded and KWAs based on the sources retained the source code. Staff members were told to sort individual tasks into categories, based on behavioral homogeneity, and to write a KWA statement to cover the behaviors in those tasks.

Staff assigned to write MDs were told to begin by reviewing existing taxonomies, in particular: (a) two Synthetic Validity (SYNVAL) project taxonomies (task categories and job activities; Peterson, Owens-Kurtz, Hoffman, Arabian, & Whetzel, 1990) (b) Army-Wide performance requirements from Army21 projects (Knapp & Campbell, 2006; Sager, Russell, Campbell, & Ford, 2005), (c) performance dimensions from military performance models, and (d) task categories from manuals and job analyses. Staff were asked to copy sources into a spreadsheet, content analyze the content, and sort like statements together. This process continued until staff members were comfortable that they had identified a reasonable set of MDs (the final total was 98) that covered statements in other taxonomies.

SME Workshops

Once KWAs and MDs were drafted, the next step was to plan SME workshops and train staff in workshop procedures. The general structure for the workshops was to have two 4-hour blocks as shown in Figures 1 and 2.

1. In-Processing (10 min.)
2. Review Major Duties (30 min.)
 - Introduce and define MDs.
 - Identify MDs relevant to Skill Level 1 (or entry officer) for this MOS
3. Review MOS-Specific and Army-Wide Job Descriptions (30 min.)
 - What is missing?
 - What is irrelevant or misstated?
4. Collect KWA ratings of Frequency, Importance, and Performance Variability (25 min.)
5. Break (15 min.) (HumRRO begins analysis of KWA ratings)
6. Collect work context ratings on two work context questionnaires (JA Pilot and O*NET) (40 min.)
7. Break (15 min.) (HumRRO analyzes KWA and work context data)
8. Review and Discuss KWA ratings (45 min.)
 - Present means and *SDs* of frequency ratings (ordered from high to low)
 - Do the means make sense (high frequency compared to low frequency)?
 - Discuss KWAs with high *SDs*. Does the high *SD* reflect the reality of the job or is it due to a problem with KWA wording?
 - Present means and *SDs* of importance ratings (ordered from high to low)
 - Do the means make sense (highest to lowest)?
 - Discuss KWAs with high *SDs*.
9. Review and Discuss work context ratings (30 min.)
 - Present means and *SDs* of ratings
 - Do the means make sense (high frequency compared to low frequency)?
 - Discuss work context items with high *SDs*.

Figure 1. Block 1 agenda.

During the first block, we collected data on occupation-specific information: MDs, KWAs, and O*NET work context variables. In the second block, we administered O*NET abilities, skills and GWA questionnaires. After each questionnaire, we analyzed the data and presented it back to SMEs for comment.

Ideally, we planned for Blocks 1 and 2 to be held on different days to allow our staff time to analyze and synthesize the data. In reality, we had to be flexible to accommodate the Army's needs. The 31A and 31B workshops were conducted as planned. For both 88A and 88M we broke the agenda into four 2-hour workshops held over four days. For 19A, 19K, 25A, and 25U we conducted the two blocks back-to-back in full-day workshops. The actual time spent on elements in the agendas also varied. When we ran short of time, we reduced the time set aside for discussion of the ratings.

1. In-Processing (10 min.)
2. Review and Discuss MOS-Specific and Army Wide Job Description Results from Block 1 Session (45 min.)
3. Introduce O*NET (10 min.)
 - What is it, in general and what it is used for?
 - Provide overview of components we will focus on (i.e., GWAs, Abilities, Skills)
4. Collect Ability and Skill Ratings (60 min.)
 - Brief training
 - Make importance and level ratings (HumRRO collects abilities data while SMEs rate skills and begins analysis)
5. Break (10 min.)
6. Review and Discuss Ability and Skill ratings (Make sense? Reasons for high SDs) (30 min.)
 - Abilities
 - Present means and SDs of importance ratings
 - Present means and SDs of level ratings
 - Skills
 - Present means and SDs of importance ratings
 - Present means and SDs of level ratings
7. Collect GWA Ratings (30 min.)
 - Brief training
 - Make importance and level ratings
8. Break (15 min.)
9. Review and Discuss GWA ratings (Make sense? Reasons for high SDs) (30 min.)
 - Present means and SDs of importance ratings
 - Present means and SDs of level ratings

Figure 2. Block 2 agenda.

Major Duties. The SMEs first reviewed the list of major duties generated by the research team prior to the workshops. The purpose of this activity was to determine which major duties were relevant to entry level in the MOS and to generate more specific work activities relevant to the major duties. We asked SMEs to review the entire list of major duties and nominate ones that were most relevant to entry level in the occupation. Because so many MDs are at least somewhat relevant, we also asked the SMEs to identify the MDs that best distinguish the occupation from others. We kept notes on the discussions and, after completion of all the workshops, we made revisions to the list of MDs.

Key Work Activities. We presented draft lists of Army-wide and occupation-specific KWAs to SMEs in the workshop. We led a discussion of the KWAs, making edits in an Excel spreadsheet, projected so that SMEs could see and approve the edits. When SMEs were satisfied with the KWA list, we printed rating forms. SMEs rated the final KWAs in terms of importance, frequency, and performance variability. We needed importance ratings for use in the analyst data

collection. The frequency and performance variability rating scales served the needs of another job analysis project. The three rating scales are shown in Figure 3.

How important is this KWA for entry-level performance in this job? 1 = Not Important 2 = Somewhat Important 3 = Important 4 = Very Important 5 = Extremely Important How frequently do entry-level enlisted Soldiers in this job perform this KWA? 1 – Once in 1 to 2 years 2 – 2-4 times a year 3 – Once or twice a month 4 – Once or twice a week 5 – Once or twice a day 6 – Once an hour 7 – Several times an hour Provided sufficient equipment and resources are available, what percentage of entry-level enlisted Soldiers in this job perform this KWA to standard? 1 – 0%-20% 2 – 21%-40% 3 – 41%-60% 4 – 61%-80% 5 – 81%-100%
--

Figure 3. KWA rating scales.

O*NET Rating Scales. For the O*NET work context, ability, skill, and GWA ratings, we used O*NET rating scales downloaded from O*NET Online. However, we did make one minor modification to the stem questions on all the questionnaires. O*NET questionnaires ask incumbents to rate *your current job*. Since we were asking higher level NCOs and officers to “make ratings for *entry-level* occupations, we altered the stem to refer to the *entry-level job*.

Work Context. The O*NET work context questionnaire (Strong et al., 1999) contains 57 items that ask raters about interpersonal relationships, physical work conditions, and structural job characteristics. The rating scales vary across items. Some of the scales are importance scales; others are frequency scales or scales customized to the question. An example item appears in Figure 4. SMEs made ratings on the 57 O*NET items.

O*NET Abilities and Skills. SMEs used the O*NET ability (Fleishman et al., 1999) and skill (Mumford, Peterson, & Childs, 1999) questionnaires to describe the abilities and skills required by Skill Level 1 for their occupation. SMEs rated each of the 52 O*NET abilities and 35 O*NET skills on a 5-point importance scale and a 7-point level scale as illustrated in Figure 5. We provided only a very brief orientation to the scales, stressing the importance of reading the anchors.

1. How often does *this entry-level job in your MOS/Branch* require face-to-face discussions with individuals and within teams?

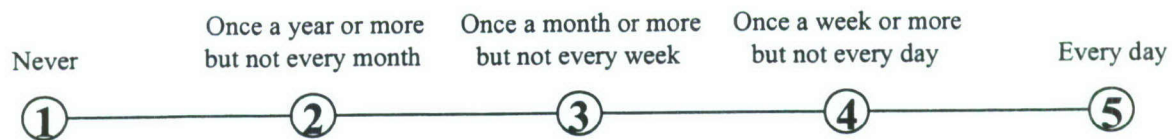


Figure 4. Example work context item.

- A. How important is ORAL COMPREHENSION to the performance of *entry-level Soldiers in your MOS/Branch*?



* If you marked Not Important, skip LEVEL below and go on to the next activity.

- B. What level of ORAL COMPREHENSION is needed by *entry-level Soldiers to perform in your MOS/Branch*?

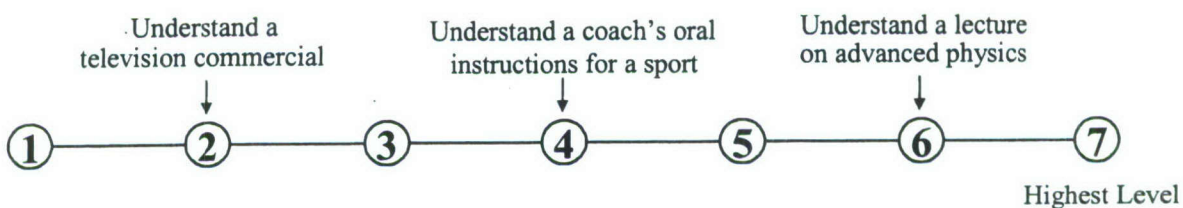


Figure 5. Example O*NET importance and level rating scales.

O*NET Generalized Work Activities. SMEs rated the O*NET's 41 GWAs using the O*NET GWA questionnaires. The questionnaires call for ratings on two scales, importance and level, formatted like those shown in Figure 5 for abilities and skills.

General process. After SMEs made ratings on descriptors, we entered and analyzed data, and presented the data back to the SMEs. We discussed the rank ordering of the descriptors, paying particular attention to descriptors that had high standard deviations, which could reflect

(a) true differences in the occupation across deployments/settings or (b) a misunderstanding of the item or scale. We took notes on SME comments.

SMEs. Most of the enlisted participants were NCOs who were currently instructors for the MOS; 88M participants were attending the Advanced Non-Commissioned Officer Course (ANCOC). Officers were typically individuals who were attending a training course or instructors for training courses. As shown in Table 1, we were unable to obtain eight SMEs for each occupation. 88A, 19A, and 19K had fewer than 8 participants. Also, two of the five 88A SMEs had to leave the workshop before completing the ability, skill, and GWA ratings. Most of the participants had recently been deployed in Iraq. Many of them had been on numerous deployments in many locations. Some of the officers had been enlisted personnel prior to becoming officers.

Table 1. SME Workshop Participants by Level and Occupation

Level	31A	31B	88A	88M	19A	19K	25A	25U
E-5, SGT		1						3
E-6, SSG		3		1		5		2
E-7, SFC		5		8		1		4
O-2, 1LT	1						1	
O-3, CPT	8		4		1		9	
O-4, MAJ			1		3			
Total	9	9	5	9	4	6	10	9

Results. Table 2 shows descriptive statistics for the KWA ratings. There was range restriction in the KWAs in terms of importance. That is, virtually all of the KWAs received mean ratings above “3” on the 5-point rating scale. This is probably because our method of KWA generation eliminated less important activities; it is also possible that SMEs were simply inclined to give high ratings of importance. There was more variability in the frequency and performance variability ratings. A separate research note (Russell, Sinclair, Erdheim, Ingerick, Owens, Peterson, & Pearlman, 2008) provides tables of descriptive statistics for KWA ratings for each occupation.

Table 2. Descriptive Statistics for Key Work Activity Ratings

Occupation	<i>n</i>	Number of KWAs	Importance (1 to 5)		Frequency (1 to 7)		Performance Variability (1 to 5)	
			Mean of <i>Ms</i>	Mdn of <i>SDs</i>	Mean of <i>Ms</i>	Mdn of <i>SDs</i>	Mean of <i>Ms</i>	Mdn of <i>SDs</i>
31A	9	45	4.23	.73	3.44	1.39	3.42	.88
31B	9	38	4.32	.83	3.63	1.41	3.36	1.20
88A	5	28	4.26	.63	4.00	.55	4.38	.58
88M	9	23	4.65	.71	4.41	1.51	3.70	1.26
19A	4	46	4.16	.50	4.02	.82	3.90	.58
19K	6	37	4.06	.82	3.52	1.15	2.87	1.11
25A	10	53	4.56	.71	4.08	1.34	4.23	1.32
25U	9	35	4.40	.67	3.86	1.22	3.62	1.00
Total <i>M</i>		38.13	4.33	.70	3.87	1.17	3.69	.99
Officer <i>M</i>		43.00	4.30	.64	3.89	1.03	3.98	.84
Enlisted <i>M</i>		33.25	4.36	.76	3.86	1.32	3.39	1.14

To examine the reliability of the KWA ratings, we calculated the intraclass correlations (ICC [3, k]; Shrout & Fleiss, 1979) among the SMEs' ratings to look at consistency across KWAs within occupations.⁷ As shown in Table 3, there was a great deal of variability in ICCs for different occupations.⁸ Reliabilities for the two officer occupations, 31A and 25A were particularly low. Using Nunnally's (1967, p. 225) equation, we estimated that the following numbers of raters would have been needed to obtain a desired multi-rater ICC of .80 (McCloy, Waugh, & Medsker, 1998): 129, 21, 12, 17, 10, 8, 46, and 13 for 31A, 31B, 88A, 88M, 19A, 19K, 25A, and 25U, respectively.⁹

One reason for lower ICCs may have been differential emphases by SMEs on stateside, in-garrison activities vs. deployment activities. For example, 31A and 31B occupations in garrison involve police work similar to that of civilian police (e.g., responding to domestic disputes), but in Iraq 31A and 31B have responsibility for guarding prisoners/detainees and going on patrol. In the 31A workshop, for example, some officers were active duty and others were in the National Guard, and some had been in the enlisted ranks prior to becoming officers. They had diverse experiences. The garrison/deployment issue came up in every workshop and was an issue for all jobs, but it may have affected some jobs more than others. To try to minimize the issue, we asked SMEs to respond from the perspective of their recent deployments. Regardless of our instructions, their perceptions continued to influence their ratings. In discussions of ratings, garrison vs. deployment was an issue, particularly for the frequency and performance variability rating scales.

Another reason for lower ICCs might have to do with the variability of officer occupations and experiences. For example, there are multiple jobs/assignments within 25A, and due to the mix and nature of SMEs' experiences, we were unable agree to a specific job/assignment within the branch for discussion. Differences in assignments frequently came up as a reason for differences in their ratings. 19A officers tended to have higher reliabilities than did the other officers. Based on discussions with SMEs and our knowledge of the jobs, it appears that 25A, 31A, and 88A are more heterogeneous, with more diverse specialties and assignments than 19A officers. Chapter III presents data showing that 25A and, to a lesser extent, 31A yielded low reliabilities on several other descriptor sets as well. This lends some additional credence to the reasons cited above for lower reliabilities.

⁷ To ensure consistency between our data and O*NET data, we wanted to use O*NET formulas (McCloy, Waugh, & Medsker, 1998) for ICCs. O*NET researchers provided SPSS™ syntax that they currently use for analyzing analyst ability ratings. We used that basic syntax for analyzing all of the descriptor sets. The formula ICC [(3,1) for single-raters and (3, k) for multiple raters] is for a two-way mixed-effects model. For readers most familiar with the language of McGraw & Wong (1996), these ICCs are consistency estimates. Finally, occasionally a rater skipped an item. To compute the ICC, which requires full data, we inserted the group mean for the missing score.

⁸ We did discuss the ratings with SMEs and made edits to the tasks if needed and even re-rated some of the tasks. The ICCs presented here are based on the original ratings of the tasks before discussion.

⁹ These are not necessarily inordinately large numbers of raters for rating specific work-oriented statements like KWAs. O*NET requires only 8 analysts for rating worker-oriented abilities and skills, but those analysts receive 2 ½ days of training and practice. O*NET requires larger numbers of incumbent raters for work-oriented GWA and work context ratings.

Table 3. Intraclass Correlations (ICCs) by Occupation for KWA Ratings

Occupation	<i>k</i>	Number of KWAs	Importance (1-5)		Frequency (1-7)		Performance Variability (1-5)	
			ICC (3,1)	ICC (3,k)	ICC (3,1)	ICC (3,k)	ICC (3,1)	ICC (3,k)
31A	9	45	.03	.23	.12	.54	.06	.38
31B	9	38	.16	.63	.32	.81	.15	.62
88A	5	28	.25	.50	.42	.69	.31	.57
88M	9	23	.19	.68	.19	.67	.03	.21
19A	4	46	.29	.62	.47	.78	.30	.63
19K	6	37	.33	.74	.46	.84	.31	.73
25A	10	53	.08	.45	.14	.62	.04	.30
25U	9	35	.24	.74	.10	.50	.12	.54
Total <i>M</i>		38.13	.20		.28		.17	
Officer <i>M</i>		43.00	.16		.29		.18	
Enlisted <i>M</i>		33.25	.23		.27		.15	

Note. *k* = number of raters. ICC (3,1) reflects single rater reliability and ICC (3,k) reflects average rater reliability.

We discussed the ratings with SMEs and made edits to the tasks if needed and in a couple of the workshops even re-rated some of the tasks. The ICCs presented here are based on the original ratings of the tasks before discussion.

While the reliabilities were lower than desired, the workshop KWA procedures accomplished two important goals for this project. First, discussing the target occupations and within-occupation differences in KWAs, SMEs were prepared to make ratings on the O*NET rating scales. Second, the KWA statements, revised based on the discussions could serve as fodder for analysts to use in making their O*NET ratings.

We conducted a number of analyses of the O*NET descriptor ratings. Specific descriptive statistics by occupation appear in a research note published separately from this report (Russell et al., 2008). The reliabilities and other relevant data are summarized and discussed in Chapter III.

Analyst Data Collection

As mentioned at the beginning of this chapter, two sets of analysts were included in the research, project analysts and O*NET analysts. Both sets of analysts participated in the same training program to learn to make ratings on the O*NET abilities and skills.

Stimulus Materials for the Ratings

Over the years, the stimulus materials for each occupation being rated have been standardized (Donsbach et al., 2003). For each of the eight Army target occupations, we prepared stimulus materials mirroring those used in the O*NET system for collecting analyst ratings on civilian occupations. These materials included:

- Title and definition of the occupation
- Task sheet: A list of tasks that were rated by Army SMEs in terms of their importance to the job.¹⁰ The tasks were categorized as:
 - Core tasks if they received a mean SME importance rating of ≥ 3.0 .
 - Supplementary tasks if they received a mean SME importance rating of < 3.0 .
- Ability sheets: A sheet for each of the 52 abilities. The following information was contained on each ability sheet:
 - The definition of the ability was listed at the top of the sheet.
 - An ability level scale with level scale anchors was provided directly beneath the definition of the ability in order to facilitate the analysts' understanding of the ability.
 - GWAs that were (a) linked to the given ability¹¹ and (b) received an SME mean importance rating of ≥ 3.0 .
 - Work Context variables (WCs) that were (a) linked to the given ability (same linkage criteria as for GWAs) and (b) received a mean SME rating of ≥ 3.0 .
- Skill sheets: A sheet was provided for each of the 35 skills. The following information was contained on each skill sheet:
 - The definition of the skill was listed at the top of the sheet.
 - A skill level scale with level scale anchors was provided directly beneath the definition of the skill in order to facilitate the analysts' understanding of the skill.
 - GWAs that were (a) linked to the given skill and (b) received an SME mean importance rating of ≥ 3.0 .
 - Work Context (WC) variables that were (a) linked to the given skill and (b) received a mean SME rating of ≥ 3.0 .

These stimulus materials matched, as closely as possible, the materials used by O*NET analysts for civilian occupations. The KWAs that came out of the Army SME workshops were used as the tasks, and, where needed, minor wording changes were made to remove military-specific language. Additionally, we prepared a glossary of Army terms for the analysts to reference as needed.

¹⁰ Since O*NET analysts are accustomed to the term tasks, we called KWAs tasks for the purpose of the analyst ratings.

¹¹ The linkage judgments were made by experienced industrial/organizational psychologists in a prior study (see Donsbach et al., 2003 for a description of the linkage study). Essentially, the judgments were made by asking whether a given ability is required to perform a particular GWA.

The analysts used the ability and skill definitions and rating scales in the O*NET questionnaires to make their ratings. These questionnaires are the same ones used in the SME workshops. A sample importance and level rating scale appears in Figure 5.

Overview of the Training

O*NET researchers allowed us to carry out our data collection efforts in concert with their ongoing O*NET data collection activities. The O*NET analyst rater training follows an analyst training manual that includes four training modules:

Module 1: History of O*NET. This module generally describes the background associated with O*NET, as well as what information O*NET Online contains. In addition, the following five rating tips are provided:

- Do not hesitate to use the extremes (1 and 5 on the Importance scales; 1 and 7 on the Level scales) when assigning the ratings. If you avoid using the extremes, you reduce the scales to fewer levels than intended.
- Do not make all ratings at one end of the rating scale. Check yourself to ensure your ratings do not cluster only at the high end or only at the low end of the scale.
- It is possible that you have formed preconceived ideas of the definition of a given occupation or descriptor. However, it is very important that you do not rely on your personal knowledge or experience to make importance and level ratings. Rather, you should use only the information provided in the stimulus materials to make these ratings.
- Be sure to consider all of the occupational information provided in the stimulus materials to make your ratings. For example, information on several descriptors relevant to the target ability or skill is presented in the stimulus materials. As you will be trained, information considered at the end of the rating process for a given ability or skill may influence, or even change, your initial rating.
- Rate abilities and skills independent of one another. That is, do not let your rating of one ability or skill influence the ratings of other abilities or skills within a given occupation. You should begin a new rating process with each ability and skill you rate. In addition, do not let your ratings from one occupation impact your ratings for another occupation.

Approximately 30 minutes are allotted for Module 1.

Module 2: Overview of the Stimulus Materials. In this module analysts review and discuss the stimulus materials that are provided to the analysts for making their ability and skill ratings. Analysts go over the definitions for each of the abilities, skills, GWAs and WCs. Analysts also review and discuss the various rating scales on which the above constructs are rated. Approximately 1 hour and 30 minutes are allotted for Module 2.

Module 3: Making Ratings. In this module a step-by-step description of the ability and skill rating process is presented. The same process is followed for making both ability and skill ratings. Time is also spent making practice ratings on several of the O*NET abilities and skills for a sample of O*NET occupations. Approximately 6 hours are allotted for Module 3. The basic steps for making an ability/skill rating are as follows:

- Step 1: Review the occupation title, definition, and tasks to get a full picture of the occupation.
- Step 2: Review the title, definition, and level scale anchors of the construct (i.e., the ability/skill in question) you are about to rate.
- Step 3: Review the tasks and their importance ratings. Focus on the core tasks first, followed by the supplementary tasks. Think of a preliminary importance rating for this construct.
- Step 4: Review the linked GWAs and their mean importance ratings. If necessary, adjust your preliminary importance rating for this construct.
- Step 5: Review the linked WC statements and their mean ratings. If necessary, adjust your importance rating for this construct.
- Step 6: Document your rating for this construct. If your importance rating was ≥ 2 , then make a level rating for this construct (repeat Steps 1 – 6).

Module 4: Recording Your Ratings. In this module, the analysts were introduced to the electronic rating form that they would be using for entering their ability and skill ratings. Three hours were allotted for Module 4.

Each of the four training module incorporates hands-on exercises and quizzes. In addition, there is a manual for the trainers with instructions for presenting information.

The standard O*NET analyst training modules described above are spread out over two days of training. We developed and administered an additional half day of training (after completion of the first two days) to acquaint raters with this evaluation project, the Army, Army occupations, and military terminology. The half-day session was a mix of lecture and hands-on practice.

For 15 of the 16 O*NET analysts, this was refresher training; they had been trained before and were excused from the first half day of training covering the history of O*NET and description of the stimulus materials. All of the project analysts and one of the O*NET analysts were newcomers to the O*NET training and attended the full 2 ½ days.

Army-Wide and MOS-Specific Tasks

Initially, we had planned to ask raters to consider Army-wide tasks (i.e., KWAs) in addition to the MOS-specific KWAs, and we had prepared an Army-wide task list for analysts to use in making their ratings. During the workshop, we decided to omit the Army-wide information for several reasons. First, there were no importance ratings for Army-wide lists like

we had for the occupation-specific task lists (i.e., KWAs). Consequently, the analysts expressed confusion about how to factor in the Army-wide list into their ratings. Second, there was a sentiment that if all Army occupations were rated on these common tasks, then the ability and skill ratings for the various Army occupations would end up looking quite similar (i.e., using the Army-wide task list might blur the distinction between the ability and skill ratings across occupations). Third, an ARI analyst indicated that ARI generally does not use an Army-wide task list to describe specific occupations. Finally, having the analysts factor in the Army-wide list along with the job-specific task list (and the WCs and the GWAs) was seen by the analysts as being overly burdensome. For these reasons, we decided to omit the Army-wide task list from the analysts' final stimulus materials.

Rating Assignments and Results

The eight project analysts each made ability and skill ratings on all 8 target occupations. Half (8) of the O*NET analysts made ratings for 31A, 31B, 88A, and 88M. The other half (8) made ratings for 19A, 19K, 25A, and 25U. Descriptive statistics for the project and O*NET analyst data appear alongside SME results in a research note published separately from this report (Russell et al, 2008). Chapter III presents reliabilities and other statistics for the analyst ratings.

III. Is O*NET Sufficient?

Chapter I posed the following question for the evaluation: Is the O*NET taxonomy sufficient for analyzing Army occupations? A complete answer to this question is not possible in a single research effort of this scope, but the basic psychometric and “content coverage” issues can be addressed for some of the O*NET descriptor domains that appear to be most useful for the Army. Accordingly, we made comparisons between Intraclass Correlation Coefficients (ICCs) and mean descriptor profiles using the data collected in SME and analyst workshops described in Chapter II.¹² Those data included ratings for eight Army occupations—31A, 31B, 88A, 88M, 19A, 19K, 25A, and 25U—on four of the O*NET occupation descriptor domains—GWAs, work context, abilities, and skills—made by three different types of raters—Army SMEs, project analysts and O*NET analysts.

Using these data, the following key evaluation questions are addressed in this chapter:

- Are Army occupations rated reliably using O*NET rating scales?
- Do ratings on O*NET rating scales differentiate Army occupations?
- How well do SME and analyst ratings of Army jobs agree?
- Are ratings on Army occupations similar in quality to ratings on civilian occupations?
- Are Army occupation profiles similar to those for their civilian counterparts?

*Are Army Occupations Rated Reliably Using O*NET Rating Scales?*

To examine the reliability of the ratings, we calculated the intraclass correlations (ICC [3, 1] and [3, k]; Shrout & Fleiss, 1979) among the analysts’ ratings to look at consistency across constructs within occupations.¹³ The O*NET target level of multi-rater reliability is a median ICC (3, k) of .80 or greater. The value of .80 has been judged to be a good rule-of-thumb that has been used previously in the O*NET context (e.g., McCloy, Waugh, & Medsker, April 1998).

Abilities and Skills

As shown in Table 4, the SME ICCs for abilities are about 20-30 points lower than those for the analyst groups. SME ratings of officer occupations yielded ICCs that were on average slightly lower than those for enlisted occupations. SME ability level ratings for 31A, 31B, and 19K reached the target ICC of .80, even though SMEs did not receive the 2 ½ day training program that analysts received. The judgments from eight project and eight O*NET analysts

¹² Our analyses were somewhat dictated by available O*NET information. While a wealth of data are available at <http://online.onetcenter.org/> for O*NET, the bulk of the reports with statistics of interest to us (e.g., ICCs) were only available for abilities.

¹³ To ensure consistency between our data and O*NET data, we wanted to use O*NET formulas (McCloy, Waugh, & Medsker, 1998) for ICCs. O*NET researchers provided SPSS™ syntax that they currently use for analyzing analyst ability ratings. We used that basic syntax for analyzing all of the descriptor sets. The formula ICC [(3,1) for single-raters and (3, k) for multiple raters] is for a two-way mixed-effects model. For readers most familiar with the language of McGraw & Wong (1996), these ICCs are consistency estimates. Finally, occasionally a rater skipped an item. To compute the ICC, which requires full data, we inserted the group mean for the missing score.

were sufficient to reach the recommended .80. There appear to be no reliability differences between the importance and level scales on abilities.

For skills, the analyst ICCs were about ten to twenty points higher than the SME ICCs for the single-rater reliabilities (see Table 5), but all groups of raters reach acceptable levels for both the importance and level scales. All rater types achieved higher ICCs on the skills than on the abilities, with exception of the 25A SME ratings.

It is important to remember that SMEs received only basic introduction to the ability and skills ratings, and both sets of analysts received extensive training. When SMEs discussed their abilities and skills ratings, they tended to agree with the rank ordering of abilities and skills based on their ratings. When we drew their attention to items with larger *SDs*, comments usually had to do with the applicability of the anchors (especially *level* anchors) to Army jobs, or their occupations, in particular. Some SMEs interpreted the anchors too literally or otherwise experienced difficulty translating the anchors to their job.

Another general theme was that some of the larger *SDs* on abilities were for psychomotor and sensory abilities. SMEs felt like some of the psychomotor variable names were hard to understand (e.g., Dynamic Flexibility) and to differentiate (e.g., Explosive Strength and Dynamic Strength). For some sensory abilities, particularly Night Vision, SMEs were unsure how to make ratings given that they have assistive devices (e.g., flashlights, goggles). These are the types of topics that are covered in the analyst training, and if the Army were to use O*NET “as is” and rely on SME raters, they could also benefit from training of that nature.

Six of the 16 O*NET analysts commented on rating the Army jobs. Four of the six stated that they thought O*NET was useful for describing the Army jobs. The other two provided suggestions for information to give analysts in the future.

Work Context

ICCs for work context ratings appear in Table 6. As shown, the multi-rater ICCs show acceptable levels of reliability for all but 88A, which had only five raters.

There was much discussion about the work context variables in most of the SME workshops, in part prompted by us. Prior to the workshops we had noted that work context might need to change somewhat for Army occupations and, therefore, we did more probing for what might be missing or what might need to change in this descriptor set.

The main issues that emerged were:

- SMEs indicated that the work context ratings were affected by the deployment or garrison assignment. For example, work hours during some deployments are 24 hours a day seven days a week. A day off during deployment might be a day doing maintenance instead of patrolling. Similarly, the physical requirements are generally higher for deployments. Some SMEs suggested that they should have made ratings separately for deployments and in-garrison activities.

Table 4. ICCs for Ability Importance and Level Ratings by Occupation and Rater Type

Occupation	Ability Importance (1-5)						Ability Level(1-7)					
	ICC (3,1)			ICC (3,k)			ICC (3,1)			ICC (3,k)		
	Army SME	Project Analyst	O*NET Analyst	Army SME	Project Analyst	O*NET Analyst	Army SME	Project Analyst	O*NET Analyst	Army SME	Project Analyst	O*NET Analyst
31A	.22	.52	.67	.72	.90	.94	.33	.54	.58	.81	.91	.92
31B	.43	.51	.55	.87	.89	.91	.44	.57	.54	.87	.91	.91
88A	.14	.51	.60	.33	.89	.92	.17	.42	.47	.38	.86	.88
88M	.26	.52	.48	.76	.90	.88	.17	.55	.51	.64	.91	.89
19A	.39	.50	.63	.72	.89	.93	.44	.47	.57	.76	.87	.91
19K	.26	.45	.50	.67	.87	.89	.44	.49	.49	.83	.88	.88
25A	.29	.67	.75	.81	.94	.96	.18	.58	.70	.69	.92	.95
25U	.20	.53	.64	.69	.90	.93	.21	.48	.60	.70	.88	.92
Total M	.27	.53	.60		.90	.92	.30	.51	.56		.89	.91
Officer M	.26	.55	.66		.91	.94	.28	.50	.58		.89	.92
Enlisted M	.29	.50	.54		.89	.90	.32	.52	.54		.90	.90

Note. ICC (3,1) reflects single rater reliability and ICC (3,k) reflects average rater reliability. There were eight raters in both the project and O*NET groups, but the number of Army SMEs varied across occupations. Sample sizes were as follows: 9, 3, 9, 4, 6, 10, 9 for 31A, 31B, 88A, 88M, 19A, 19K, 25A, and 25U, respectively. Mean ICCs are not provided for multi-rater Army SMEs estimates because the number of raters varied across occupations.

Table 5. ICCs for Skill Importance and Level Ratings by Occupation and Rater Type

Occupation	Skill Importance (1-5)						Skill Level (1-7)					
	ICC (3,1)			ICC (3,k)			ICC (3,1)			ICC (3,k)		
	Army SME	Project Analyst	O*NET Analyst	Army SME	Project Analyst	O*NET Analyst	Army SME	Project Analyst	O*NET Analyst	Army SME	Project Analyst	O*NET Analyst
31A	.55	.81	.85	.92	.97	.98	.54	.78	.82	.91	.97	.97
31B	.53	.79	.81	.91	.97	.97	.54	.73	.80	.91	.96	.97
88A	.68	.68	.75	.86	.94	.96	.59	.63	.80	.81	.93	.97
88M	.43	.56	.66	.87	.91	.94	.40	.49	.65	.86	.89	.94
19A	.68	.79	.77	.90	.97	.97	.61	.71	.72	.86	.95	.95
19K	.55	.71	.67	.88	.95	.94	.63	.61	.63	.91	.93	.93
25A	.13	.54	.56	.56	.91	.91	.11	.43	.53	.55	.86	.90
25U	.50	.59	.66	.90	.92	.94	.44	.57	.63	.88	.91	.93
Total M	.51	.68	.72		.94	.95	.48	.62	.70		.93	.91
Officer M	.51	.71	.73		.95	.96	.46	.64	.72		.93	.95
Enlisted M	.50	.66	.70		.94	.95	.50	.60	.68		.92	.94

Note. ICC (3,1) reflects single rater reliability and ICC (3,k) reflects average rater reliability. There were eight raters in both the project and O*NET groups, but the number of Army SMEs varied across occupations. Sample sizes were as follows: 9, 3, 9, 4, 6, 10, 9 for 31A, 31B, 88A, 88M, 19A, 19K, 25A, and 25U, respectively. Mean ICCs are not provided for multi-rater Army SMEs estimates because the number of raters varied across occupations.

Table 6. ICCs by Occupation for Work Context Ratings

Occupation	<i>n</i>	ICC (3,1)	ICC (3,k)
31A	9	.47	.89
31B	9	.50	.90
88A	5	.48	.73
88M	9	.36	.84
19A	4	.58	.84
19K	6	.64	.91
25A	10	.44	.89
25U	9	.46	.88
Total <i>M</i>		.49	
Officer <i>M</i>		.49	
Enlisted <i>M</i>		.49	

Note. ICC (3,1) reflects single rater reliabilities and ICC (3,k) reflects average rater reliabilities. Mean ICCs are not provided for multi-rater Army SMEs estimates because the number of raters varied across occupations.

- Some Army-specific work context variables are probably needed to address the following issues:
 - *Work Pace.* One WC item asks how important is it to keep a pace set by machinery or equipment. It prompted a discussion about how work pace varies for combat and non-combat activities.. During battle, the pace is influenced by available technology as well as other factors (e.g., own and enemy troop strength).
 - *Working with little sleep.* The discussion of work hours also prompted discussions about sleep deprivation. SMEs said that sleep deprivation affects the mission and is influenced by the mission. It appears that junior officers, in particular, often operate with very little sleep. It would seem that the need to work with little sleep could be an important context element to capture.
 - *Communicating with indigenous people, host nation counterparts, peers and superiors.* Another theme that tended to come from officers had to do with communications. During deployments, junior officers have been assigned to work with host nation counterparts (e.g., Iraqi junior officers) and to negotiate with indigenous leaders about activities and resources. While much of the negotiation takes place through an interpreter, it is still a challenge to deal with the cultural differences in the negotiation. They also thought something could be added to reflect their need to persuade or influence their peers or superiors.
 - *Travel, overseas travel, and extended time away from home.* SMEs mentioned that items could deal with being separated from one's normal environment (e.g., in a foreign country) for an extended period of time.
 - *Lifting heavy weight.* Some SMEs felt that lifting heavy weight was not sufficiently covered in the WC items.
- SMEs suggested that Army examples could be added to some items to make them clearer. For example, a WC item about protective gear could add examples of combat gear to the list of civilian gear in that item.

Generalized Work Activities

As shown in Table 7, all of the occupations have acceptable levels of reliability, except for 25A. (MOS 88A and 19A had low numbers of raters, but would reach the .80 level of reliability if at least 6 raters were used). GWA ratings, like those for work context and KWAs, are influenced by variability within the jobs and across deployment experiences of SMEs. As described in Chapter II, work variability was an issue for several jobs and for 25A in particular.

Table 7. ICCs by Occupation for Generalized Work Activity Ratings

Occupation	<i>n</i>	Importance		Level	
		ICC (3,1)	ICC (3,k)	ICC (3,1)	ICC (3,k)
31A	9	.50	.90	.56	.92
31B	9	.57	.92	.63	.94
88A	3	.43	.69	.48	.73
88M	9	.42	.87	.42	.87
19A	4	.40	.73	.50	.80
19K	6	.58	.89	.61	.90
25A	10	.25	.77	.19	.70
25U	9	.41	.86	.45	.88
Total <i>M</i>		.45		.48	
Officer <i>M</i>		.40		.43	
Enlisted <i>M</i>		.50		.53	

Note. ICC (3,1) reflects single rater reliabilities and ICC (3,k) reflects average rater reliabilities. Mean ICCs are not provided for multi-rater Army SMEs estimates because the number of raters varied across occupations.

As they did with the ability and skills scales, SMEs tended to agree with the rank ordering of GWAs based on their mean ratings. When we prompted them to discuss GWAs with high *SDs*, the main issue was the applicability of the level anchors. For instance, the level anchors for “Inspecting equipment, structures, or materials” – “Check that doors to building are locked,” “Inspect equipment in a chemical processing plant,” and “Inspect a nuclear reactor” – required too great of an inference for some SMEs to be certain of a rating. Even so, they were able to make their judgments reliably.

Do Ratings on O*NET Rating Scales Differentiate Army Occupations?

Differentiation among occupations is very important to the Army, as it is needed for accurate classification of recruits into occupations based on their abilities and skills. Tables 4 and 5 showed that O*NET analysts rated the abilities and skills more reliably than did SMEs and project analysts, albeit the differences between O*NET and project analyst ICCs were small. But, it is possible that the analysts agree with each other but do not pick up on important differences among occupations.

We used a multi-trait multi-method approach (Campbell & Fiske, 1959) to address this issue. High correlations among different types of raters for the same occupation (e.g., correlation between 31A ratings made by SMEs and project analysts) would indicate convergent validity. That is, different methods (i.e., rater types) yield converging results for an occupation. If these

convergent validity correlations are higher than the correlation between different occupations rated by the same rater type (e.g., the correlation between 31A and 19K ratings made by project analysts), there is evidence of discriminant or divergent validity. Divergent validity for a rater type would indicate that the raters are differentiating occupations.

To assess convergence and divergence, we computed correlations among mean ability level vectors by occupation and analyst type, as shown in Table 8, and did the same for mean skill level vectors (Table 9). Table 10 summarizes across Tables 8 and 9. We also investigated divergence for WCs and GWAs, where we had no separate rater types to compare. Those data are discussed after abilities and skills.

Convergent Correlations based on Ability and Skill Level Ratings

Table 10 illustrates three main points regarding convergent correlations:

- First, regarding analyst type, project and O*NET analyst means correlate very highly (mean $r = .79$ for abilities and $.92$ for skills across all occupations). SME and project analysts ratings correlated more highly than SME and O*NET analyst ratings. SME ratings were less reliable than the other two. Even so, correcting for unreliability would not change the fact that SME and O*NET analyst ratings correlate less than SME and project analysts because the reliabilities for the O*NET and project analysts were almost the same.
- Second, for abilities, the convergent correlations were higher for enlisted occupations than officer occupations ($r_s = .53, .36$, and $.77$ for officer compared to $.60, .45$, and $.81$ for enlisted). This suggests that the three rater types had a better and more common understanding of the ability requirements of the enlisted occupations.
- Third, convergent correlations were higher for skills than for abilities.

Divergent Correlations Based on Ability and Skill Level Ratings

Three points can also be made with regard to the divergent correlations in Table 10:

- The O*NET analyst ratings, on average, differentiated less between occupations than did either the SME or the project analyst ratings. Specifically, the O*NET analysts mean ratings for different occupations were correlated $.60$ (abilities) and $.65$ (skills) on average. In contrast, SME and project analyst mean ratings for different occupations correlated between $.44$ and $.59$, indicating more differentiation, particularly for the abilities. It is possible that SMEs and project analysts understood the KWAs better and could therefore

Table 8. Ability Level Correlations by Occupation and Rater Type

		31A			31B			88A			88M			19A			19K			25A			25U		
Rater Type		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
31A	1	.81																							
	2	.41	.91																						
	3	.18	.75	.92																					
31B	1	.79	.32	.05	.87																				
	2	.63	.76	.52	.72	.91																			
	3	.47	.62	.76	.51	.74	.91																		
88A	1	.52	.47	.28	.43	.43	.31	.38																	
	2	.35	.85	.66	.22	.61	.48	.41	.86																
	3	.03	.60	.90	-.10	.29	.59	.27	.61	.88															
88B	1	.59	.29	-.05	.69	.51	.26	.31	.33	-.17	.64														
	2	.51	.49	.23	.64	.71	.52	.26	.58	.10	.68	.91													
	3	.43	.55	.60	.50	.67	.84	.24	.55	.51	.43	.75	.89												
19A	1	.68	.60	.26	.72	.67	.51	.52	.60	.17	.61	.68	.51	.76											
	2	.43	.78	.49	.39	.65	.45	.36	.87	.45	.50	.72	.61	.66	.87										
	3	.18	.73	.77	.09	.47	.55	.25	.84	.79	.15	.44	.61	.44	.77	.91									
19K	1	.47	-.09	-.23	.69	.33	.23	.34	-.12	-.29	.61	.49	.33	.39	.05	-.20	.83								
	2	.52	.32	.12	.73	.63	.52	.22	.41	.03	.67	.89	.72	.70	.60	.35	.62	.88							
	3	.33	.35	.34	.49	.52	.66	.25	.47	.31	.49	.76	.84	.55	.55	.55	.47	.82	.88						
25A	1	.24	.57	.55	.08	.32	.24	.39	.61	.52	.12	.15	.16	.31	.41	.51	-.12	-.02	.05	.69					
	2	-.04	.54	.75	-.17	.18	.34	.27	.58	.83	-.13	.01	.25	.15	.38	.70	-.37	-.09	.13	.63	.92				
	3	-.09	.45	.71	-.21	.13	.32	.21	.57	.83	-.17	.06	.30	.10	.40	.77	-.39	-.03	.24	.56	.93	.95			
25U	1	.40	.12	.05	.47	.30	.32	.34	.16	.07	.46	.45	.38	.42	.21	.10	.54	.52	.53	.26	.15	.12	.71		
	2	-.01	.35	.62	-.10	.10	.40	.23	.35	.72	-.11	.04	.32	.09	.21	.52	-.15	.00	.27	.38	.86	.80	.37	.89	
	3	-.07	.32	.64	-.11	.12	.46	.16	.35	.75	-.14	.11	.44	.10	.24	.58	-.18	.08	.40	.34	.81	.84	.39	.91	.91

Note. Rater types were as follows: 1 = SME raters. 2 = Project Analysts. 3 = O*NET Analysts. Reliabilities (ICC [3,k]) appear on the diagonal. Same-occupation correlations are in bold.

Table 9. Skill Level Correlations by Occupation and Rater Type

31A			31B			88A			88M			19A			19K			25A			25U		
1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
31A	1	.91																					
	2	.80	.97																				
	3	.75	.96	.97																			
31B	1	.41	.29	.28	.91																		
	2	.71	.82	.80	.65	.96																	
	3	.63	.78	.78	.68	.95	.97																
88A	1	.84	.73	.68	.36	.67	.58	.81															
	2	.73	.89	.89	.44	.82	.81	.73	.93														
	3	.67	.84	.90	.43	.81	.83	.67	.94	.97													
88B	1	.33	.19	.21	.77	.46	.43	.30	.41	.41	.86												
	2	.20	.27	.27	.73	.55	.64	.28	.55	.51	.65	.89											
	3	.36	.49	.49	.73	.75	.85	.38	.67	.69	.55	.87	.94										
19A	1	.85	.78	.73	.57	.81	.78	.83	.82	.76	.47	.51	.60	.86									
	2	.68	.86	.91	.40	.76	.79	.65	.95	.95	.34	.50	.64	.77	.95								
	3	.67	.87	.93	.31	.73	.73	.68	.91	.92	.26	.42	.58	.73	.94	.95							
19K	1	.11	.01	.04	.77	.32	.35	.10	.25	.26	.87	.72	.58	.34	.21	.16	.91						
	2	.18	.27	.28	.72	.54	.64	.22	.52	.50	.62	.93	.85	.48	.51	.39	.71	.93					
	3	.11	.25	.28	.70	.52	.64	.19	.50	.50	.59	.87	.82	.45	.49	.39	.64	.95	.93				
25A	1	.49	.45	.41	.41	.30	.34	.50	.56	.42	.38	.43	.33	.55	.55	.52	.33	.40	.33	.55			
	2	.59	.65	.62	.40	.54	.54	.70	.80	.71	.35	.55	.53	.67	.75	.70	.28	.57	.53	.66	.86		
	3	.48	.68	.74	.34	.59	.59	.57	.87	.86	.36	.52	.57	.56	.86	.84	.26	.53	.54	.54	.84	.90	
25U	1	.21	.18	.19	.63	.37	.38	.30	.41	.36	.74	.64	.51	.43	.33	.30	.71	.70	.73	.47	.54	.46	.88
	2	-.01	.08	.06	.57	.27	.32	.18	.34	.28	.62	.72	.52	.31	.26	.19	.69	.78	.79	.35	.57	.44	.83
	3	.08	.24	.23	.66	.45	.55	.14	.49	.42	.57	.82	.72	.36	.42	.34	.64	.88	.91	.39	.56	.55	.81
																							.93

Note. Rater types were as follows: 1 = SME raters, 2 = Project Analysts, 3 = O*NET Analysts. Reliabilities (ICC [3,k]) appear on the diagonal. Same-occupation correlations are in bold.

Table 10. Mean Convergent and Divergent Correlations for Ability and Skill Level Ratings

	Abilities	Skills	Mean
Convergent Correlations			
<i>(same occupation, different rater types)</i>			
SME-Project Analysts			
All 8 occupations	.56	.73	.64
Officers	.53	.74	.63
Enlisted	.60	.71	.65
SME-O*NET Analysts			
All 8 occupations	.41	.67	.54
Officers	.36	.67	.52
Enlisted	.45	.68	.56
Project Analysts-O*NET Analysts			
All 8 occupations	.79	.92	.85
Officers	.77	.92	.84
Enlisted	.81	.91	.86
Mean			
All 8 occupations	.58	.77	.68
Officers	.55	.78	.66
Enlisted	.62	.77	.69
Divergent Correlations			
<i>(different occupations, same rater type)</i>			
SMEs			
All 8 occupations	.44	.50	.47
Officers	.44	.68	.56
Enlisted	.58	.75	.66
Project Analysts			
All 8 occupations	.48	.59	.54
Officers	.67	.82	.74
Enlisted	.40	.63	.51
O*NET Analysts			
All 8 occupations	.60	.65	.63
Officers	.80	.87	.83
Enlisted	.61	.75	.68
Mean			
All 8 occupations	.51	.58	.54
Officers	.64	.79	.71
Enlisted	.53	.71	.62

Note. Mean divergent correlations for all 8 occupations were combined across 28 between-occupation correlations. Mean divergent correlations for officer and for enlisted are each based on six correlations.

better infer the abilities and skills needed to perform them.¹⁴ It is also possible that SMEs and project analysts were factoring in Army-wide (AW) tasks. Recall that O*NET and project analysts were instructed to make their ratings based on occupation-specific information. Even so, most project analysts would have been familiar with AW tasks and may have taken that into account.

- The O*NET and project analysts differentiated enlisted occupations better than officer occupations. For example, for abilities, the average project analyst divergent correlation for enlisted occupations (.40) was considerably lower than that for officer occupations (.67). O*NET analyst data yielded average correlations of .61 for enlisted and .80 for officer occupations. Another hypothesis/explanation is that officer occupations are truly less divergent (in terms of required skills and abilities) and this is being accurately picked up by the analysts; i.e., the officer occupations may not provide that strong a test of the divergence hypothesis. Officer jobs require the performance of a more common series of functions irrespective of job-specific content (e.g., planning missions, supervising or leading others, managing operations).
- Finally, overall, there was better differentiation on average for the abilities than for the skills.

Ability and Skill Level Divergence and Convergence Summary

Probably the most salient finding is that ability level ratings appear to show convergence and divergence for enlisted occupations. The mean enlisted ability convergent correlation was .62 compared to the average divergent correlation of .53. In our sample of occupations, there was less convergence and less divergence for officer occupations.

For skills, convergence/divergence was better when all 8 occupations were included in the means (.77 for convergence and .58 for divergence). When officers and enlisted are compared separately, there was less discrimination on skills. We suspect that this is because skill level means were fairly low for enlisted occupations and higher for officer occupations (see Table 14). As a result, including the cross-rank correlations increased the variance for the across-all-eight occupation computations.

Convergence and Divergence of WCs and GWAs

For WCs and GWAs, we had no rater types to compare. We defined convergence as the multi-rater reliability (where individual raters are the methods) and divergence as the cross-occupation correlations. Work context occupation intercorrelations and reliabilities appear in Table 11. Those data for GWAs appear in Table 12.

¹⁴ Project analyst ratings appeared to show slightly more differentiation despite the fact that we would have expected their mean ratings to be more highly correlated due to systematic rater effects (i.e., all project analysts rated all occupations). Rater effects should play a smaller role in O*NET analyst ratings since two different groups of eight raters each rated four of the occupations.

Table 11. Work Context Correlations by Occupation

	31A	31B	88A	88M	19A	19K	25A	25U
31A	.89							
31B	.74	.90						
88A	.79	.63	.73					
88M	.54	.61	.50	.84				
19A	.49	.49	.67	.49	.84			
19K	-.05	.20	-.02	.59	.39	.91		
25A	.76	.53	.66	.54	.33	-.08	.89	
25U	.53	.58	.57	.81	.42	.46	.67	.88

Note. Correlations are based on the SME Work Context means for each occupation. Multi-rater ICCs appear on the diagonal.

Table 12. GWA Level Correlations by Occupation

	31A	31B	88A	88M	19A	19K	25A	25U
31A	.92							
31B	.31	.94						
88A	.77	.37	.73					
88M	.21	.72	.38	.87				
19A	.75	.44	.64	.51	.80			
19K	.08	.73	.28	.84	.51	.90		
25A	.23	-.21	.14	-.25	-.03	-.40	.70	
25U	.13	.67	.33	.76	.42	.79	-.04	.88

Note. Correlations are based on the SME GWA means for each occupation. Multi-rater ICCs appear on the diagonal.

Table 13 provides a summary across the WC and GWA correlation matrices. The multi-rater reliabilities for both WCs and GWAs are reasonably high, indicating convergence within the occupations, and are considerably higher than the correlations across different occupations (the off-diagonal elements of Tables 11 and 12), suggesting divergence. The GWAs appear to show better differentiation for officer than for enlisted occupations, while the WCs yield a little better differentiation for enlisted than officer occupations.

Table 13. Mean Convergent and Divergent Correlations for WC and GWA Level Ratings

	WC	GWA
Convergent Correlations		
<i>(multi-rater ICCs)</i>		
All 8 occupations	.86	.84
Officers	.84	.79
Enlisted	.88	.90
Divergent Correlations		
<i>(different occupations)</i>		
All 8 occupations	.49	.36
Officers	.62	.42
Enlisted	.54	.75

Note. Mean divergent correlations for all 8 occupations were combined across 28 between-occupation correlations. Mean divergent correlations for officer and for enlisted are each based on six correlations.

How Well Do SME and Analyst Ratings Agree?

Table 10 showed that the two types of analyst ratings correlated more highly with each other than they did with SMEs. The project analyst to SME correlation was higher than the O*NET analyst to SME correlation for both abilities and skills.

To further investigate SME-analyst differences, we examined descriptive statistics and effect sizes. A summary of the descriptive statistics appears in Table 14. The findings across scales were highly consistent. Regarding mean ratings, SMEs gave the highest mean ratings, regardless of the scale, project analysts gave the next highest, and O*NET analysts gave the lowest. This is consistent with previous O*NET research showing that incumbents tend to give higher ratings than analysts (Peterson et al., 1999). In looking at the *SDs* and the standard errors of the mean (*SE_M*), which were also higher for SMEs, it is important to note that some of the SME groups had very small *ns* making these statistics more difficult to compare directly to those for analysts.

Another salient finding in Table 14 is that ability importance, ability level, skill importance, and skill level are consistently rated lower for enlisted than officer occupations, regardless of rater type. This is particularly notable for the skill level ratings where there is consistently one *SD* or more difference between the officer and enlisted skill level means. In at least one of the officer workshops, officers commented that they felt the skills were particularly relevant to officer occupations and that they expected their enlisted counterparts would score low on skills. This is likely because the skills include several descriptors that get at management and supervision.

To get a better feel for the magnitude and direction of differences in mean ratings, we computed effect sizes for rater type difference on each ability and averaged them across abilities. The differences are not trivial. As shown in Table 15, the standardized mean difference (*d*) between SME and O*NET analyst ratings across all abilities was 1.21; between SME and project analyst ratings this value was .76, and between project and O*NET analysts it was .48. The biggest effect sizes between O*NET analysts and SMEs were typically for physical, psychomotor, and sensory abilities, with SME ratings being much higher than O*NET analyst ratings. In terms of specific abilities, the largest differences were for Dynamic Flexibility, Night Vision, Sound Localization, Reaction Time, Trunk Strength, Number Facility, and Wrist-Finger Speed.

Table 15 also compares the magnitude of the SME-analyst differences to incumbent-analyst differences reported during O*NET prototype development work (Peterson et al., 1999). In that work D^2 , the squared difference between rater type means, was used to measure the difference. For abilities, the average $D^2 = .99$ in the O*NET prototype work. For the current effort, the D^2 values were much higher, 2.22 for SME-O*NET analyst differences and 1.33 for SME-project analyst differences. It should be noted, however, that the O*NET prototype data were collected for 32 occupations, thus the occupations sampled could have played a role in the differences between the two studies.

Table 14. Summary Descriptive Statistics on Ability and Skill Scales Across Occupations by Rater Type

Scale	Army SME			Project Analyst			O*NET Analyst		
	Mean of Ms	Mdn of SDs	Mdn of SE_M	Mean of Ms	Mdn of SDs	Mdn of SE_M	Mean of Ms	Mdn of SDs	Mdn of SE_M
Ability Importance									
All Occupations	3.53	.88	.33	3.08	.70	.25	2.92	.59	.21
Officers	3.73	.82	.33	3.19	.69	.25	3.06	.58	.21
Enlisted	3.34	.95	.33	2.97	.71	.25	2.78	.59	.21
Ability Level									
All Occupations	4.10	1.15	.43	3.34	.86	.31	2.96	.78	.27
Officers	4.35	1.02	.41	3.55	.89	.32	3.15	.77	.27
Enlisted	3.84	1.28	.44	3.14	.84	.30	2.78	.78	.28
Skill Importance									
All Occupations	3.13	.78	.29	2.90	.63	.22	2.73	.55	.20
Officers	3.80	.66	.27	3.28	.67	.24	3.04	.58	.21
Enlisted	2.45	.90	.32	2.53	.58	.21	2.42	.53	.19
Skill Level									
All Occupations	2.96	.99	.37	2.73	.84	.30	2.55	.77	.27
Officers	3.90	.90	.36	3.28	.79	.28	2.97	.74	.27
Enlisted	2.02	1.09	.38	2.18	.89	.32	2.13	.79	.28

Note. There were eight raters in both the project and O*NET groups, but the number of Army SMEs varied across occupations. Sample sizes were as follows: 9, 9, 3, 9, 4, 6, 10, 9 for 31A, 31B, 88A, 88M, 19A, 19K, 25A, and 25U, respectively.

Table 15. Effect Sizes for Rater Types on Ability Level Scales

Ability	<i>M(d)</i>				<i>M(D²)</i>		
	SME- Project Analyst	SME- O*NET Analyst	Project Analyst- O*NET Analyst	Project Analyst- O*NET Analyst	SME- Project Analyst	SME- O*NET Analyst	Analyst- Incumbent O*NET
1 Oral Comprehension	.51	.87	.44	.11	.24	.28	.75
2 Written Comprehension	1.18	1.40	.13	.08	1.14	1.14	.94
3 Oral Expression	-.03	.58	.83	.21	.11	.15	.90
4 Written Expression	.35	.56	.25	.18	.46	.33	.79
5 Fluency of Ideas	-.19	.01	.22	.33	.44	.11	.43
6 Originality	.13	.27	.17	.08	.34	.36	1.39
7 Problem Sensitivity	.46	.60	.18	.13	.43	.29	1.83
8 Deductive Reasoning	.47	.47	.07	.03	.17	.20	.85
9 Inductive Reasoning	-.07	-.12	-.17	.11	.47	.33	.97
10 Information Ordering	.06	-.03	-.10	.04	.30	.17	.56
11 Category Flexibility	.45	.25	-.32	.28	.68	.60	1.18
12 Mathematical Reasoning	1.23	.85	-.55	.44	2.56	1.01	.76
13 Number Facility	1.29	2.16	.51	.48	2.65	4.27	.83
14 Memorization	.78	1.81	1.11	1.0	.75	3.01	.67
15 Speed of Closure	-.13	.69	1.11	1.0	.51	.67	.62
16 Flexibility of Closure	.41	.76	.43	3	.35	1.02	.81
17 Perceptual Speed	.24	.51	.32	.45	.39	.67	.71
18 Spatial Orientation	.60	1.15	.76	.23	.92	2.18	.53
19 Visualization	.80	1.23	.44	.81	.85	1.67	.67
20 Selective Attention	.49	1.50	.98	.49	.46	1.60	2.15
21 Time Sharing	.57	1.11	.61	.78	.74	1.58	2.25
22 Arm-Hand Steadiness	.63	1.17	.49	.43	.94	1.38	.91
23 Manual Dexterity	1.07	1.50	-.12	.16	1.83	1.94	1.26
24 Finger Dexterity	1.68	1.06	-.44	.37	2.18	1.08	.92
25 Control Precision	.31	.52	.26	.29	.25	.55	.62
26 Multilimb Coordination	.27	.38	.20	.20	.26	.37	.86
27 Response Orientation	.71	1.18	.61	.10	1.08	1.49	.69
28 Rate Control	.69	1.48	1.01	.22	1.09	3.67	1.15
29 Reaction Time	.70	2.29	1.43	1.5	1.65	4.86	1.13
30 Wrist-Finger Speed	1.56	2.13	.41	2.6	4.91	7.25	.87
31 Speed of Limb Movement	1.01	1.97	.97	1	1.90	4.70	1.57
32 Static Strength	.97	1.58	.31	.39	1.66	2.34	.79
33 Explosive Strength	1.32	1.86	.43	.81	3.63	5.65	.63
34 Dynamic Strength	1.37	2.13	.21	.29	2.61	3.72	.76
35 Trunk Strength	1.88	2.21	.10	.78	3.06	3.38	.48
36 Stamina	1.37	1.98	.45	.30	2.01	3.26	1.04
37 Extent Flexibility	1.04	1.30	.12	.05	1.86	1.86	.74
38 Dynamic Flexibility	2.28	3.30	.83	.23	6.93	10.44	1.07
39 Gross Body Coordination	1.42	1.71	.13	.51	1.39	1.72	1.36
				.11			

Table 15. Effect Sizes for Rater Types on Ability Level Scales

		$M(d)$				$M(D^2)$		
Ability		SME- Project Analyst	SME- O*NET Analyst	Project Analyst- O*NET Analyst	Project Analyst- O*NET Analyst	SME- Project Analyst	SME- O*NET Analyst	Analyst- Incumbent O*NET
40	Gross Body Equilibrium	1.37	1.72	.07	.13	2.24	2.30	1.06
41	Near Vision	.82	.87	-.03	.21	1.19	.63	.73
42	Far Vision	.82	1.43	.62	.56	.72	2.24	.53
43	Visual Color Discrimin.	1.06	.97	-.02	.17	1.55	1.48	.83
44	Night Vision	.67	2.37	1.56	4.0 9 1.7	1.23	7.65	.69
45	Peripheral Vision	.64	1.34	.82	4	1.50	4.02	.91
46	Depth Perception	.75	1.16	.45	.34	1.22	1.81	.50
47	Glare Sensitivity	.08	.83	.67	.65	.79	1.12	1.14
48	Hearing Sensitivity	.36	.77	.38	.15	.34	.64	.80
49	Auditory Attention	.66	1.47	.78	.75 2.7	1.02	2.64	1.54
50	Sound Localization	.95	2.30	1.13	0	1.85	8.34	1.82
51	Speech Recognition	.09	.24	.18	.25	.69	.48	1.68
52	Speech Clarity	.53	.84	.25	.17	.50	.77	1.75
<i>Mean</i>		.74	1.21	.42	.56	1.33	2.22	.99
<i>Mean abs </i>		.76	1.21	.48				

Note. $M(d)$ is the mean of the standardized mean differences among raters across occupations. D^2 is the squared difference between rater type means. Data in the Analyst-Incumbent O*NET column are from the O*NET prototype development work (Peterson et al., 1999).

Table 16 reports the same results for skills. As shown, the d values were much smaller for skills than for abilities. On average, $|d|$ was .28 for project analyst-O*NET analyst, .47 for SME-project analyst, and .64 for SME-O*NET analyst. Also the magnitude of the SME-O*NET analyst difference using the D^2 value ($m = 1.23$) was closer to the value achieved for analysts and incumbents in the O*NET prototype study ($m = .95$) than was the case for abilities.

Table 16. Effect Sizes for Rater Types on Skill Level Scales

Skill	<i>M(d)</i>			<i>M(D²)</i>			
	SME- Project Analyst	SME- O*NET Analyst	Project Analyst- O*NET Analyst	Project Analyst- O*NET Analyst	SME- Project Analyst	SME- O*NET Analyst	Analyst- Incumbent O*NET
1 Reading Comprehension	.87	.89 1.0	-.03	.21	.56	.44	.75
2 Active Listening	.47	3	.68	.32	.70	.81	.94
3 Writing	-.02	.20	.30	.10	.40	.26	.90
4 Speaking	-.11	.35	.59	.21	.36	.30	.79
5 Mathematics	1.0 4	1.5 0	.17	.58	2.2 3	2.7 5	.43
6 Science	1.1 9	1.3 6	.40	.23	2.5 0	3.3 5	1.39
7 Critical Thinking	-.29	.04	.40	.10	.50	.53	1.83
8 Active Learning	-.03	.26	.35	.13	.24	.37 1.4	.85
9 Learning Strategies	.75	.86	.21	.16	.89 1.2	0 1.0	.97
10 Monitoring	-.54	-.46	.19	.23	3	6	.56
11 Social Perceptiveness	.22	.28	.04	.10	.40	.39	1.18
12 Coordination	-.09	.01	.18	.23	.69	.29	.76
13 Persuasion	.21	.03	-.31	.41	.70 1.1	.99 1.0	.83
14 Negotiation	-.22	-.13	-.04	.28	2	0	.67
15 Instructing	.32	.27	.03	.15	.72 1.2	.56	.62
16 Service Orientation	.14	.26	.12	.19	3 1.2	.86 1.2	.81
17 Complex Problem Solving	-.50 1.0	-.48 2.8	.03	.05 1.2	3 3.5	8 6.8	.71
18 Operations Analysis	9 1.0	2 1.2	.63	8	5 3.1	5 2.7	.53
19 Technology Design	9	4	.19	.73	8 1.4	8 2.2	.67
20 Equipment Selection	.75 1.1	.99 2.0	.27	.22	6 1.6	2 2.9	2.15
21 Installation	2	9	.99	.62	1	5	2.25
22 Programming	-.11	-.50	-.45	.41	.37 1.9	.38 1.4	.91
23 Quality Control Analysis	-.99	-.73	.50	.47	2	4	1.26
24 Operations Monitoring	.15	-.14	-.42	.36	.27	.21	.92
25 Operation and Control	.16	-.03 1.3	-.17	.13	.80 1.6	.53 2.7	.62
26 Equipment Maintenance	.65	5	.64	.54	3	0	.86
27 Troubleshooting	.22	.57	.34	.18	.84	.56	.69
28 Repairing	.25	.47	.02	.21	.55	.91	1.15
29 Systems Analysis	-.29	-.30	.03	.14	.18	.46	1.13
30 Systems Evaluation	-.29	-.34	-.12	.16	.56	.58	.87
31 Judg. and Dec. Making	-.28	-.33	-.01	.13	.76	.88	1.57

Table 16. Effect Sizes for Rater Types on Skill Level Scales

Skill	<i>M(d)</i>			<i>M(D²)</i>			
	SME- Project Analyst	SME- O*NET Analyst	Project Analyst- O*NET Analyst	Project Analyst- O*NET Analyst	SME- Project Analyst	SME- O*NET Analyst	Analyst- Incumbent O*NET
32 Time Management	.68	.43	-.24	.19	.53	.32	.79
33 M. of Financial Resources	.87	.99	.07	.14	1.8	1.8	.63
34 M. of Material Resources	-.15	.36	.45	.29	.50	.39	.76
35 M. of Personnel Resources	-.36	-.46	-.07	.14	.22	.56	.48
<i>Mean</i>	.23	.42	.17	.29	1.0	1.2	.95
<i>Mean abs </i>	.47	.64	.28		4	3	

Note. *M(d)* is the mean of the standardized mean differences among raters across occupations. *D²* is the squared difference between rater type means. Data in the Analyst-Incumbent O*NET column are from the O*NET prototype development work (Peterson et al., 1999).

Are Ability Ratings for Army Occupations Similar in Quality to Ratings for Civilian Occupations?¹⁵

We compared our data to data available for O*NET abilities to determine whether the Army data were comparable in quality to O*NET data, based on indicators used by O*NET researchers. This section focuses only on abilities because comparable O*NET data for skills, work context, and GWAs were not available.

Ability Flags

O*NET researchers use three criteria to flag the ability data (Willison, Byrum & Tsacoumis, 2007).

1. *Not Relevant.* The level rating of an ability is flagged as “not relevant” for a particular occupation if two or fewer of the eight analysts rated its importance as two or greater.
2. *Large SE_M Importance.* The importance rating is flagged if it had a standard error of the mean (SE_M) greater than .51. An SE_M greater than .51 means that the upper and lower bounds of the confidence interval are more than one scale point away from the observed mean.
3. *Large SE_M Level.* The level rating is flagged if it had a standard error of the mean (SE_M) greater than .51, for the same reason noted in the previous point.

The flags are used by O*NET researchers for reporting purposes. For example, if an ability is flagged as “not relevant,” the O*NET database will indicate “not relevant” and will not provide numeric data for the ability. Similarly, the SE_M flags determine whether importance and level information will be reported.

¹⁵ O*NET data for this section was only available for abilities.

Table 17 shows the result of applying the ability flags to the project and O*NET analyst data for Army occupations, along with O*NET results from six cycles of data collection.¹⁶ As shown, there were far fewer “Not Relevant” flags for Army occupations than are typical for civilian occupations in the *Standard Occupational Classification (SOC)*—the system used by the U.S. government to categorize all occupations. Some physical (e.g., explosive strength, dynamic flexibility) and sensory (e.g., night vision, sound localization) descriptors were flagged as not relevant for over half of the *SOC* occupations, but were relevant for all of the Army occupations in our sample. Similarly, psychomotor descriptors (e.g., response orientation, speed of limb movement) were flagged as not relevant for over 30% of the *SOC* occupations, but they were relevant for the Army occupations. These results seem to make sense. A smaller proportion of civilian than military occupations require physical, psychomotor, and sensory abilities. These results suggest that military occupations require a wider range of abilities than do civilian occupations.

The SE_M flags were established to capture those ratings deemed to have insufficient agreement across raters. As shown in Table 17, *SOC* importance ratings on abilities are rarely flagged on SE_M , and none of the Army occupation importance ratings were flagged. The flags on ability level were different. Here the O*NET analyst data for Army occupations yielded fewer flags than the project analyst data did. O*NET analyst level flags for Army occupations were in a comparable range of those observed for O*NET analyst level ratings for *SOC* occupations.

Descriptive Statistics and Reliabilities for Abilities

We compared ratings on abilities made by O*NET analysts for this project to those made by O*NET analysts in the most recently published cycle of analyst results (cycle 7; Willison, Byrum, & Tsacoumis, 2007). Cycle 7 had 101 occupations. As shown in Table 18, the mean of the mean importance rating on Army occupations, 2.92, was higher than the means of the means across 101 occupations. Even so, the individual means were within the range observed for *SOC* occupations. The *SD* and SE_M for importance were also within the range observed for the O*NET occupations. The level scale ratings are on the high side compared to those in the O*NET cycle 7 data. Even so, the *SD* and SE_M values are comparable to those observed for O*NET cycle 7 occupations.

The data in Table 19 show that O*NET analysts rated Army occupations just as reliably as they rated civilian occupations, at least for this set of eight Army occupations. The average and range of the reliabilities were very similar across the Army and cycle 7 occupations.

Do the Score Profiles for Army Occupations Look Like Those for Similar Civilian Occupations?

¹⁶ Cycle 1 data were from the O*NET prototype and were not analyzed in the same way as other cycles. Cycle 8 and 9 data are not yet available. We did not include Army SME data in this analysis because the statistics computed in this section are dependent upon sample size for interpretation and the number of Army SMEs varied across occupations, making the data difficult to compare to the other rater types that all had 8 raters.

We used the multi-trait multi-method approach (Campbell & Fiske, 1959) again, this time to assess convergence and divergence of Army and *Standard Occupational Classification (SOC)* data. For these analyses, Army and *SOC* are treated as different methods of measuring the same occupation. Using the crosswalk in O*NET, we identified civilian occupations in the *SOC* that appeared to be the best possible match with our target Army occupations. The result appears in Table 20. For all of the occupations except 25A and 25U, the O*NET crosswalk provided an obvious direct match. For 25A and 25U, we examined several descriptions and chose the one that appeared to be the best match. While the O*NET crosswalk identified counterparts for the 19A and 19K jobs, it did not provide any data on those counterpart occupations.

Next, for each descriptor set, we correlated vectors of mean ratings for the Army and *SOC* occupations. For abilities data, we used O*NET analyst ratings because O*NET reports analyst data. For all of the other descriptor sets (skills, GWAs, and work context) we used SME data because O*NET data on these descriptors are from incumbents. The results for correlations of the ability level profiles appear in Table 21. As shown, Army occupations were fairly highly correlated with their civilian counterparts in terms of ability level ratings. For example, the 31A

Table 17. Comparability of Military and Civilian Ability Ratings in Terms of Flags

Flag	Statistic	ONET DATA						O*NET Evaluation Data		
		Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	O*NET Total Across Cycles 2-7	Project Analysts	ONET Analysts
Relevance Flag										
	Total Flags	1490	1228	1599	1027	845	605	6794	5	14
	Number of Occupations	126	109	100	91	100	101	627	8	8
	Total Possible Flags	6552	5668	5200	4732	5200	5252	32604	416	416
	Percentage	22.74%	21.67%	30.75%	21.70%	16.25%	11.52%	20.84%	1.20%	3.37%
Importance SE Flag										
	Total Flags	6	0	0	0	0	0	6	0	0
	Number of Occupations	126	109	100	91	100	101	627	8	8
	Total Possible Flags	6552	5668	5200	4732	5200	5252	32604	416	416
	Percentage	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%
Level SE Flag										
	Total Flags	389	438	120	109	49	119	1224	37	20
	Number of Occupations	126	109	100	91	100	101	627	8	8
	Total Possible Flags	6552	5668	5200	4732	5200	5252	32604	416	416
	Percentage	5.94%	7.73%	2.31%	2.30%	0.94%	2.27%	3.75%	8.89%	4.81%

Note. O*NET data are from the O*NET analyst cycle 7 report (Willison, Byrum, & Tsacoumis, 2007). O*NET Evaluation data are from the current project.

Table 18. Comparison of Civilian and Army Descriptive Statistics for Ability Ratings made by O*NET Analysts

Occupation	Ability Importance			Ability Level		
	Mean of <i>Ms</i>	Mdn of <i>SDs</i>	Mdn of <i>SE_{MS}</i>	Mean of <i>Ms</i>	Mdn of <i>SDs</i>	Mdn of <i>SE_{MS}</i>
31A	3.01	.53	.19	3.10	.71	.25
31B	3.00	.67	.24	3.00	.73	.26
88A	3.09	.73	.26	3.15	.86	.30
88M	2.78	.64	.23	2.84	.74	.26
19A	3.20	.53	.19	3.35	.76	.27
19K	2.86	.53	.19	2.80	.76	.27
25A	2.94	.53	.19	3.00	.74	.26
25U	2.49	.52	.18	2.47	.90	.32
Mean	2.92	.59	.21	2.96	.78	.27
101 Occupations (O*NET Cycle 7)						
Mean	2.59	.60	.21	2.33	.74	.26
<i>SD</i>	.26	.11	.04	.35	.10	.04
Min	2.00	.35	.13	1.58	.46	.16
Max	3.18	.89	.31	3.02	.99	.35

Table 19. Comparability of Civilian and Army Reliabilities for Ability Ratings made by O*NET Analysts

	Ability Importance		Ability Level	
	O*NET Cycle 7	Army Occupations	O*NET Cycle 7	Army Occupations
# Occupations	101	8	101	8
Mean	.92	.92	.92	.91
Min	.84	.88	.84	.88
Max	.99	.96	.99	.95

Note. All reliabilities are ICC (3,8) estimates for O*NET analysts.

Table 20. Standard Occupational Classification (SOC) Counterparts for Army Target Occupations

Army Target Occupation	Standard Occupational Classification (SOC) Counterpart
31A Military Police (Officer)	33-1012.00 1 st Line Supervisors/Managers of Police and Detectives
31B Military Police (Enlisted)	33-3051.01 Police Patrol Officer
88A Transportation (Officer)	11-3071.00 Transportation Manager
88M Motor Transport Operator (Enlisted)	53-3032.00 Truck Driver, Heavy and Tractor-Trailer
19A Armor (Officer)	55-1013.00 Armored Assault Vehicle Officers*
19K M1 Armor Crewman (Enlisted)	55-3013.00 Armored Assault Vehicle Crew Members*
25A Signal (Officer)	11-3021.00 Computer and Information Systems Managers
25U Signal Support Systems Specialist (Enlisted)	15-1071.00 Network and Computer Systems Administrators

*These SOC codes were listed as counterpart civilian occupations by O*NET. Even so, O*NET does not contain data for them.

Table 21. Correlations of Ability Level Profile Means for Target Army and SOC Occupations

	SOC Occupations										Army MOS				
	1st Line Sup. Police	Police Officer	Police Patrol Officer	Trans. Mgr.	Truck Driver, Heavy	Computer Sys. Mgr.	Network & Comm. Sys. Admin.	31A	31B	88A	88M	19A	19K	25A	25U
1 st Line Supervisors/Managers of Police and Detectives	1.00														
Police Patrol Officer	.80	1.00													
Transportation Manager	.54	.26	1.00												
Truck Driver, Heavy and Tractor Trailer	.21	.27		1.00											
Computer and Information Systems Manager	.63	.37		.94	1.00										
Network & Computer Systems Administrators	.49	.19		.88	-.31	.93	1.00								
31A Military Police (Officer)	.80	.75		.58	.05	.73	.60	1.00							
31B Military Police (Enlisted)	.45	.72		.05	.31	.34	.13	.76	1.00						
88A Transportation (Officer)	.75	.61		.71	.00	.81	.77	.90	.59	1.00					
88M Motor Transport Operator (Enlisted)	.44	.74		-.10	.49	.13	-.02	.60	.84	.51	1.00				
19A Armor (Officer)	.77	.71		.52	.20	.64	.49	.77	.55	.79	.61	1.00			
19K M1 Armor Crewman (Enlisted)	.25	.52		-.20	.58	-.05	-.02	.34	.66	.31	.84	.55	1.00		
25A Signal (Officer)	.71	.45		.79	-.14	.86	.85	.71	.32	.83	.30	.77	.24	1.00	
25U Signal Support Systems Specialist (Enlisted)	.46	.36		.54	-.09	.78	.81	.64	.46	.75	.44	.58	.40	.84	1.00

Note. Bold indicates intended counterpart occupations. The average correlation between SOC and Army counterparts was .73, while the average correlation between SOC and Army non-counterparts was .41. The average correlation among SOC occupations was .37, and the average correlation among Army occupations was .60. Correlations were based on O*NET analyst ratings. No counterpart occupations were identified in O*NET for 19A and 19K.

ability level means correlated .80 with the ability level means for 1st Line Supervisors of Police and Detectives. On average, the Army occupations correlated more highly with their counterparts ($r = .73$) than they did with the non-counterparts ($r = .41$) or with the other Army occupations ($r = .60$).

Table 22 summarizes the results across abilities, skills, WCs, and GWAs. The results were very consistent. Army occupations correlated most highly with their *SOC* counterparts for all descriptor sets; they did not correlate as highly with non-counterpart *SOC* occupations. Both convergence and divergence were strong for the ability level ratings in particular. It is worth noting, though, that the correlations among occupations based on the GWA ratings were considerably lower than those for the other three descriptor sets.

Table 22. Summary of Intercorrelations Among Army and Selected SOC Counterpart Occupations

	Ability Level	Skill Level	GWA Level	Work Context	Mean
Convergent Correlation—The average correlation between <i>SOC</i> and Army counterparts	.73	.64	.43	.66	.61
Divergent Correlation—The average correlation between <i>SOC</i> and Army non-counterparts	.41	.47	.17	.40	.36
The average correlation among <i>SOCs</i> only	.37	.51	.42	.69	.50
The average correlation among Army only	.60	.50	.36	.49	.49

Note. Correlations for abilities are based on O*NET analyst ratings. Correlations for skills, GWAs, and work context are based on SME ratings.

Summary

In this chapter we made comparisons between intraclass correlation coefficients (ICCs), mean descriptor profiles, and effect sizes, and used the multi-trait multi-method approach to address five key evaluation questions:

- Are Army occupations rated reliably using O*NET rating scales?
- Do ratings on O*NET rating scales differentiate Army occupations?
- How well do SME and analyst ratings of Army jobs agree?
- Are ratings on Army occupations similar in quality to ratings on civilian occupations?
- Are Army occupation profiles similar to those for their civilian counterparts?

*Do raters rate Army occupations reliably using O*NET rating scales?*

- For abilities (Table 4), including eight raters as recommended by O*NET procedures, both project and O*NET analyst data yielded averaged reliabilities of about .90, well above the recommended .80. However, SME reliabilities were generally lower than recommended. The .80 level was reached for two and three occupations, respectively, for level and

importance. In general, six to 25 SME raters would be required to achieve the recommended reliability level of .80.¹⁷

- Reliability estimates were generally higher for skills than abilities for all types of raters. On skills (Table 5), Army SMEs achieved the recommended .80 reliability level for all occupations but one, 25A Signal officers, which also yielded anomalous results for other descriptors (see Chapter 1 for possible explanations). Project and O*NET analyst ratings achieved reliabilities of about .93.
- For work context descriptors (rated only by SMEs), on average, the work context ratings reached the recommended reliability level of .80. The only exception was 88A Transportation officer which only had 5 raters. Discussion with SMEs indicated that there may be additional contextual factors appropriate for the Army environment, especially those relevant to combat, that should be added.
- SME ratings on GWAs, on average, reached the recommended level of reliability. The only occupation which legitimately yielded lower than this recommended level was 25A, Signal officer. The other occupations with reliabilities below this level had less than eight raters.
- On the whole, project analysts and O*NET analysts produced more than adequate levels of reliability for abilities and skills. SMEs also produced adequate levels of reliability for work context and GWAs.

*Do ratings on O*NET rating scales differentiate Army occupations?*

- SMEs better differentiated Army occupations than did project analysts or O*NET analysts; their average correlation between different occupations was .47 across abilities and skills. Project analysts differentiated more than O*NET analysts (average $r_s = .54$ and $.63$, respectively). These correlations certainly indicate some degree of differentiation of occupations.
- The ability level ratings appear to show both convergence and divergence for enlisted occupations. The mean enlisted convergent correlation for ability level was .62, as compared to the average divergent correlation of .53. In our sample of occupations, there was less convergence and less divergence for officer occupations based on ability.
- For skills, convergence/divergence was better when all eight occupations were included in the means (.77 for convergence and .58 for divergence). When officers and enlisted were analyzed separately, there was less discrimination on skills. Officer skill level means were an SD or more higher than those for enlisted occupations. Therefore, there is considerably

¹⁷ SMEs received only basic introduction to the abilities and skills ratings, and both sets of analysts received extensive training.

more variance in the skill level ratings when both officer and enlisted occupations are included.

- The multi-rater reliabilities for both WCs and GWAs are reasonably high, indicating convergence within the occupations, and they are considerably higher than the correlations across different occupations, suggesting divergence.

How well do SME and analyst ratings agree?

- Analyst ratings, on average, correlated more highly with each other ($r = .85$) than they did with SME ratings ($r = .64$ and $.54$, respectively for project and O*NET analysts). For abilities, the project analyst-to-SME correlation was higher than the O*NET analyst-to-SME correlation. For skills, both types of analyst ratings correlated about the same with SME ratings.
- SMEs rated importance and level on abilities and skills higher than did either project or O*NET analysts; project analysts gave slightly higher ratings than did O*NET analysts.
- Effect sizes showed these differences to be fairly large for SMEs, as compared to the two sets of analysts. The standardized mean difference (d) between SME and O*NET analyst ratings across all abilities was 1.21; the mean d between SME and project analyst ratings was .74, and the mean d between project and O*NET analysts was .42. Effect sizes for skills were much smaller, about half as large.
- It appears that project and O*NET analysts reach a fairly high level of agreement, both in terms of correlations between ratings and magnitude of ratings. On the other hand, SMEs reach only moderate levels of agreement with either set of analysts, although agreement is somewhat better for skills than abilities.

Are ratings on Army occupations similar in quality to ratings on civilian occupations?

- There were far fewer “Not Relevant” flags for Army occupations than is typical for SOC occupations; this is almost certainly due to the greater prevalence of requirements for physical, psychomotor, and sensory abilities in Army occupations as compared to SOC occupations.
- The SE_M flags were comparable to those found for SOC occupations, indicating similar agreement among raters.

Are Army occupation profiles similar to those for their civilian counterparts?

- Ability, skill, GWA, and WC ratings for Army occupations, on average, correlated higher with ability, skill, GWA, and WC ratings for their SOC counterparts (mean $r = .61$) and did not correlate as highly ratings for non-counterpart SOC occupations (mean $r = .36$).

IV. Analysis of Fit Between Major Duties and Generalized Work Activities

Purpose

Generalized Work Activities in the O*NET are defined as “an aggregation of similar occupation activities/behaviors that underlie the accomplishment of major work functions” (p. 106, Peterson, et al., 1999). The Army’s Major Duties (MDs) are defined as higher-order statements that describe a definable and nontrivial duty, or responsibility, for which a Soldier (or Officer) is accountable to perform, which has stakeholders to whom the results (i.e., outputs) are important and meaningful, and which entails work of significant complexity and duration.

As part of the evaluation of the utility of the O*NET for Army use, the evaluation of the relationship between these two sets of descriptors seemed in order. If O*NET GWAs appear to be related to or “cover” all or many of the Army MDs, then they would seem to be quite useful for providing a higher-order description of Army occupations (i.e., one that would encompass the major duties performed in the Army).

To make this evaluation, we asked non-incumbent raters to rate the degree to which each MD was “covered” by each GWA, with no occupation specifically identified (i.e., the MD might be imagined to be a part of any of several occupations; no particular occupation was implicated). The rating of “coverage” of duties by GWAs was an experiment to identify the degree to which project staff considered the GWAs to “cover” or, in the words of the O*NET definition of a GWA, “underlie” the major duties. Raters were instructed to read the definition and anchors for the first GWA and then make a judgment regarding the extent to which the GWA covers the MD using the following scale:

0 = little or no coverage of MD (most or all of MD not subsumed by the GWA)

1 = partial coverage of MD (some of MD subsumed by the GWA)

2 = strong coverage of MD (most of MD subsumed by the GWA)

Although it is difficult to exactly specify what might be considered a sufficient amount of “coverage” of a major duty by GWAs, we believe it can be plausibly argued that if *at least one GWA shows “strong” coverage of a major duty, that is sufficient*—given the rating instructions that we used in this experiment. Likewise, if *no GWAs show at least “partial” coverage for an MD, then coverage is insufficient*. We recognize that the degrees of coverage between these two extreme kinds of scores are more difficult to characterize in terms of sufficiency, and that observers can reasonably differ on this matter.

MD x GWA Exercise Method

Practically speaking, the rating task had to be divided up. There are 41 O*NET GWAs and 98 major duties (as described in Chapter II). This yields over 4,000 separate ratings. Consequently, we undertook a preliminary set of judgments to divide the major duties into three groups corresponding to the three major factors of the GWAs (identified in early research with the O*NET; Peterson et al, 1999, pp. 122): (a) Working with and Directing Others, (b) Working

with Information, and (c) Manual, Physical or Technical Activities. Three judges (the project director and two senior consultants acting as technical advisors for the project) independently categorized each MD into one of these three categories. Where all three judges agreed, the MD was put into that category. Where there was not universal agreement, the differences were discussed and a consensus was reached. As a result, 17 major duties were placed into two categories, and two MDs were placed in three categories because they appeared complex enough to require judgments about the “coverage” by GWAs in more than one category. Appendix B shows the placement of the major duties into the three categories. Note that this process assumes that the GWAs that were not rated against an MD would have been rated “0” (little or no coverage) for the MD. We believe this is a safe assumption; we tried to err on the side of over-including the MD by putting it in multiple categories if we questioned its categorization.

The three judges determined that a small subset of the MDs were non-technical performance categories, derived mainly from performance rating categories used in prior Army projects. In this way, they were fundamentally different from other MDs (higher-order activities/tasks) and from the GWAs. By removing these MDs from the exercise, the judges essentially determined that they were not covered by the GWAs, because they are different in nature from them (i.e., GWAs are aggregations of activities). They might map better against other descriptor sets in O*NET, such as Work Styles. Those MDs were:

- Demonstrate Military Presence
- Manage Own Duties and Responsibilities
- Demonstrate Extra Effort and Personal Initiative on the Occupation
- Manage Own Professional Development
- Demonstrate Personal Integrity
- Exhibit Self-Control
- Model Correct Behavior to Soldiers

We created four forms in Excel workbooks for the exercise. Many MDs had been categorized into the Working with Information factor; therefore, we split those MDs across two rating forms. The other two rating forms were for the Working With and Directing Others factor and the Manual, Physical and Technical Activities factor. MDs were listed in the rows; GWAs were listed in the columns. Full definitions for both the MDs and GWAs were also provided in workbooks and appear in Appendix C of this report. Raters were instructed to study the GWAs and their definitions, then read the definition of the first MD and rate the extent to which that MD was covered by the GWA using the three-category rating scale described above.

Raters were project staff, comprised of a combination of HumRRO and ARI personnel. Each rater was assigned to complete 2 to 4 forms, depending upon his or her availability. Ratings were made by a total of 11 staff: seven with Ph.Ds, one highly experienced master’s level staff member, and three junior staff with relevant experience and education. Ten raters completed the Manual Physical and Technical Activities form; eight raters completed each of the other three forms.

Results

Reliability

Reliability of the ratings completed by the judges was assessed by computing the correlations between each pair of rater's ratings, across the entire set of ratings within each of the four exercises; computing the mean of these correlations; and then correcting the mean correlation to the number of raters in the exercise. This method corresponds closely to the $R_{(1)}$ and $R_{(k)}$ cases of the intraclass correlation (McGraw & Wong, 1996).

The reliability estimates for the ratings are shown in Table 23. Note that the single-rater reliability should be used to compare the reliabilities across rating exercises because different exercises had different numbers of raters. The "Manual, Physical, and Technical Activities" exercise showed the highest reliability, while the two "Working With Information" exercises showed the lowest reliabilities. All of the ratings are at acceptable levels; none of the single-rater reliabilities are less than .42 and the lowest k-rater reliability, of most concern here, was .85.

Table 23. Reliability estimates for GWA Extent-of-Coverage Ratings

Type of Activities	Number of Major Duties	Number of O*NET Generalized Work Activities	Number of Ratings Made	Number of Raters	One-rater Reliability	k-rater Reliability
Manual, Physical and Technical	42	8	336	10	.60	.94
Working With and Directing Others	29	17	493	8	.55	.91
Working With Information (A)*	19	23	437	8	.42	.85
Working With Information (B)*	18	23	414	8	.42	.85

Note. The single-rater reliability was computed by correlating each rater's profile of ratings with each of the other rater's profile of ratings, and then computing the average correlation between raters (the "number of ratings made" is the number of observations in the "profile," over which the correlation was computed). The k-rater reliability was computed by applying the Spearman-Brown Prophecy Formula to the single-rater reliability.

*The "Working With Information" Major Duties were split into two rating tasks, but the GWAs remained constant for the two tasks.

Descriptive Statistics

We computed the mean and standard deviation of the ratings of each GWA for each MD. The marginal means and standard deviations of the matrix of mean ratings were computed; that is, the average of each row (an MD) of means and the average of each column (a GWA) of means were computed, as well as their standard deviations. Detailed summaries of these statistics for each of the four rating exercises are shown in the tables in Appendix D.

We identified two main indicators of the extent to which an MD is covered by GWAs—(a) the maximum rating and (b) the distribution of mean ratings across GWAs for a MD. The maximum mean rating for each MD across all the GWAs (for which it was rated) would identify MDs that are mostly subsumed by one or more GWAs. The second indicator combined the mean ratings (i.e., the strength of coverage) and the number of GWAs receiving that mean rating.

We prepared a frequency distribution showing the number of mean GWA ratings for each MD that fell into the following intervals:

- < .50 (meaning that, on average, more than half the judges rated the GWA as having “little or no coverage”)
- .50 to .99 (meaning that, on average, at least half the judges rated the GWA as having “partial coverage”)
- 1.0 to 1.50 (meaning that, on average, all the judges rated the GWA as having “partial coverage”)
- >1.50 (meaning that, on average, more than half the judges rated the GWA as having “strong coverage”)

Table 24 shows the results in order by the number of GWAs rated, on average, greater than .99 (A comparable table ordered by item number appears in Appendix E). The first two columns of the table show the MD ID# and title. The next four columns show the distribution of the mean ratings across the four intervals described above. The next column shows the number of mean ratings that were greater than .99. Note that the total number of ratings varies across the major duties, for reasons described above (i.e., the number of ratings for a MD varied across forms and some MDs were repeated across forms). The final column shows our judgments about the coverage of each MD by the O*NET GWAs. Those judgments were made according to the following decision rules:

- *Full Coverage*—For the MD, at least one GWA had a mean rating greater than 1.50
- *High Partial Coverage*—For the MD, no GWAs had a mean rating greater than 1.50, but at least six GWAs had mean ratings greater than .99
- *Low Partial Coverage*—For the MD, no GWAs had a mean rating greater than 1.50, and three to five GWAs had mean ratings greater than .99
- *Not Covered*—For the MD, no GWAs had a mean rating greater than 1.50, and fewer than three GWAs had ratings greater than .99

The first rule was intended to account for the situation where a specific MD is specific to one GWA and well-covered by it. The GWAs tend to be broader than the MDs, therefore, an MD can fall almost completely within one GWA. For example, MD #67, Maintain Physical Fitness, is characterized as “Full” coverage, but has only one GWA rated greater than zero—but that GWA is Performing General Physical Activities (defined as “Performing physical activities that require considerable use of your arms and legs and moving your whole body...”). Similarly, MDs # 42 and # 43, Drive Wheeled Vehicles and Drive Water Craft, respectively, have just one GWA rated greater than zero—but it is # 21, Operating Vehicles, Mechanized Devices, or Equipment (defined as “Running, maneuvering, navigating, or driving vehicles or mechanized equipment such as forklifts, passenger vehicles, aircraft, or water craft”). These GWAs do seem to fully cover the MDs for which they were so highly rated.

Table 24. Summary of Ratings of "Coverage" By GWAs of Army Major Duties (By Number of Average Ratings > .99)

ID #	Major Duty	Number of GWAs with Average Ratings:				Avg. Ratings > .99	Judged Coverage
		<0.50	.50 to .99	1.00 to 1.50	>1.50		
83	Plan and organize operations/missions and team tasks	17	9	9	5	14	Full
29	Provide technical guidance and advice on the installation, maintenance, and use of equipment	17	13	5	5	10	Full
81	Contribute to team planning	17	13	7	3	10	Full
59	Schedule patients and medical services		5	7	2	9	Full
40	Monitor and control financial resources	8	7	6	2	8	Full
62	Collect and analyze weather and environmental data	9	6	5	3	8	Full
20	Troubleshoot and repair personal computers and computer networks	18	6	6	1	7	Full
31	Analyze intelligence data	8	9	5	1	6	Full
45	Order supplies and equipment	8	9	5	1	6	Full
75	Direct peers and individual team members	7	4	3	3	6	Full
18	Install and maintain personal computers and peripheral equipment	20	6	4	1	5	Full
25	Collect and decode electronic signals	13	5	2	3	5	Full
26	Analyze electronic signals	14	4	4	1	5	Full
27	Provide data processing and programming support	11	7	3	2	5	Full
33	Collect information from and on individuals and groups	25	10	3	2	5	Full
37	Prepare and process forms	15	3	3	2	5	Full
39	Write documents and correspondence	15	3	4	1	5	Full
44	Inspect, store, and issue supplies	16	10	5	0	5	High Partial
94	Coordinate with other units and non-Army personnel	21	14	3	2	5	Full
7	Navigate from point to point	21	6	4	0	4	High Partial
19	Install and maintain computer networks	21	6	2	2	4	Full
38	Maintain records and files	18	1	2	2	4	Full
58	Provide medical treatment	27	17	3	1	4	Full
61	Perform laboratory procedures	21	6	3	1	4	Full
76	Support peers and individual team members	12	1	1	3	4	Full
84	Direct and motivate individual Soldiers	9	4	3	1	4	Full
87	Administer personnel actions and procedures	14	5	3	1	4	Full
88	Manage and monitor operations/missions and team tasks	10	3	3	1	4	Full
4	Inspect and maintain weapons	3	2	1	2	3	Full
6	Troubleshoot and repair weapons	4	1	1	2	3	Full
10	Scout and identify targets	14	6	1	2	3	Full
11	Fire heavy direct fire weapons	4	1	2	1	3	Full
12	Fire indirect fire weapons	20	8	2	1	3	Full
14	Install and maintain electronic equipment	3	2	2	1	3	Full
15	Troubleshoot and repair electronic equipment	4	1	1	2	3	Full
16	Install and maintain electrical and power transmission systems	3	2	3	0	3	Low Partial
17	Troubleshoot and repair electrical and power transmission systems	3	2	1	2	3	Full
22	Operate personal computers and networks	17	3	2	1	3	Full
24	Send and receive radio messages	17	3	3	0	3	High Partial
35	Troubleshoot and repair mechanical equipment	3	2	1	2	3	Full
46	Manage and control traffic	10	10	3	0	3	High Partial

Table 24. Summary of Ratings of "Coverage" By GWAs of Army Major Duties (By Number of Average Ratings > .99)

ID #	Major Duty	Number of GWAs with Average Ratings:				Avg. Ratings > .99	Judged Coverage
		<0.50	.50 to .99	1.00 to 1.50	>1.50		
47	Operate hand-operated power excavating equipment	4	1	2	1	3	Full
48	Operate heavy equipment	4	1	1	2	3	Full
50	Repair metal structures or parts	4	1	3	0	3	Low Partial
51	Construct metal or steel structures	4	1	3	0	3	Low Partial
60	Provide counseling and other interpersonal interventions	10	4	2	1	3	Full
63	Conduct land surveys	17	3	2	1	3	Full
64	Deliver presentations	31	6	1	2	3	Full
77	Train peers and individual team members	11	3	2	1	3	Full
82	Contribute to team coordination	9	5	1	2	3	Full
86	Communicate information to Soldiers, peers, and superiors	32	5	1	2	3	Full
89	Direct and lead platoons/squads/teams	9	5	2	1	3	Full
92	Build and manage platoon/squad/team cohesion	10	4	1	2	3	Full
93	Engage and negotiate with host nationals and local leaders.	10	4	0	3	3	Full
2	Handle demolitions or mines	2	4	1	1	2	Full
3	Engage in hand-to-hand combat	6	0	1	1	2	Full
5	Fire direct fire weapons	5	1	2	0	2	Low Partial
9	Provide emergency first aid	39	7	1	1	2	Full
23	Record and document audiovisual information	19	2	0	2	2	Full
30	Translate foreign languages	13	8	1	1	2	Full
32	Control individuals and crowds	20	3	1	1	2	Full
34	Inspect and maintain mechanical equipment	2	4	0	2	2	Full
36	Operate gas and electric powered equipment	5	1	1	1	2	Full
41	Load and unload supplies	6	0	0	2	2	Full
49	Install, maintain, and repair plastic and fiberglass	4	2	2	0	2	Low Partial
52	Install, maintain, and repair pipe assemblies	4	2	2	0	2	Low Partial
53	Construct wooden buildings and structures	5	1	1	1	2	Full
54	Construct masonry buildings and structures	5	1	1	1	2	Full
55	Produce technical drawings and illustrations	19	2	1	1	2	Full
57	Prepare patients and equipment for medical procedures	21	2	1	1	2	Full
65	Reproduce printed materials	6	0	2	0	2	Not
74	Contribute to team tasks	13	2	1	1	2	Full
85	Train and coach Soldiers	12	3	0	2	2	Full
91	Support individual Soldiers	12	3	0	2	2	Full
1	Protect against NBC hazards	4	3	1	0	1	Low Partial
8	Maintain personal and operational security	6	1	1	0	1	Not
13	Drive track vehicles	6	1	0	1	1	Full
28	Produce maps, overlays, or range cards	12	10	1	0	1	High Partial
42	Drive wheeled vehicles	7	0	0	1	1	Full
43	Drive water craft	7	0	0	1	1	Full
56	Prepare food and beverages	5	2	1	0	1	Low Partial
67	Maintain physical fitness	7	0	0	1	1	Full
78	Help peers and individual team members	14	2	1	0	1	Low Partial
79	Monitor peer and individual team member performance	12	4	1	0	1	Low Partial
80	Monitor team performance	13	3	1	0	1	Low Partial

Table 24. Summary of Ratings of "Coverage" By GWAs of Army Major Duties (By Number of Average Ratings > .99)

ID #	Major Duty	Number of GWAs with Average Ratings:				Avg. Ratings > .99	Judged Coverage
		<0.50	.50 to .99	1.00 to 1.50	>1.50		
21	Operate electronic equipment	6	2	0	0	0	Not
73	Follow orders and rules	16	1	0	0	0	Not

Note. Rating scale was; 0=little or no coverage; 1=partial coverage; 2=strong coverage.

Using these criteria, 67 of the 87 MDs had "Full" coverage, five had "High Partial" coverage, 11 had "Low Partial" coverage, and four were not covered.

If we examine the 15 MDs in the "Not Covered" and "Low Partial Coverage" categories, we perhaps can identify some kinds of duties for which the Army might need supplemental GWAs. We have made an initial grouping of these 15 MDs as follows:

Trades-Related:

- Install and maintain electrical and power transmission systems
- Repair metal structures or parts
- Construct metal or steel structures
- Install, maintain, and repair plastic and fiberglass
- Install, maintain, and repair pipe assemblies

Hazard/Combat Related:

- Fire direct fire weapons
- Protect against NBC hazards
- Maintain personal and operational security

Team-Related:

- Help peers and individual team members
- Monitor peer and individual team member performance
- Monitor team performance

Miscellaneous:

- Operate electronic equipment
- Prepare food and beverages
- Follow orders and rules

It is somewhat puzzling that the "Trades-related" group appears here; it would seem that a sizable set of civilian occupations would include these types of activities. A reviewer suggested that this could have been due to raters' interpretations of the GWAs which are broad. Possibly, but we tend to agree with the raters. The means and standard deviations of the ratings appear in a research note published separately from this document (Russell et al., 2008).

It is not surprising that at least some, combat-specific MDs received low-partial coverage ratings. Of the thirteen combat-specific MDs, nine received full coverage judgments (e.g., handle demolitions or mines, troubleshoot or repair weapons), one received a high partial coverage judgment (navigate from point-to-point on the ground), and the remaining three (fire direct weapons, protect against NBC hazards, and maintain personal and operational security) were deemed low partial or not covered. This might seem counterintuitive; it could be argued that even though an MD is linked or rated as being covered by multiple GWAs, the most critical aspect of it is not sufficiently covered by any of the linked GWAs. Our data do not support that notion. Given the instructions that we gave raters, they should not have rated an MD highly if a critical aspect of it was not covered. It is important to remember that the *SOC* (O*NET) does include occupations that use weapons and demolitions, drive heavy equipment, and provide emergency and disaster response. Given that, it makes sense that only a few combat MDs would not be covered well.

It would seem that one or more Army-specific GWAs might usefully be created for the Hazard/Combat Related grouping and/or for the Team-Related grouping. If this were undertaken, then other MDs having similar content to these two groupings might be identified to inform the development of such GWAs.

The Miscellaneous grouping is a hodge-podge: "Operate electronic equipment" could be its own GWA, as perhaps could "Prepare food and beverages," while "Follow orders and rules" does not seem like an activity in the sense of the other MDs.

Several approaches could be used to remedy MD areas with lack of GWA coverage. One would be to add several new specific GWAs; another might be to add only a few broad GWAs; another might be to expand the definitions of existing GWAs to include such MDs.

V. Summary and Discussion

The evaluation focused primarily on the usefulness of the O*NET system for Army occupation analysis *for selection and classification purposes*. We focused on the appropriateness of O*NET descriptors that would typically be used in an Army occupational analysis for selection and classification purposes. These included abilities, skills, GWAs, and WCs.

Our approach was designed to address the following six questions:

1. Are Army occupations rated reliably using O*NET rating scales?
2. Do ratings on O*NET rating scales differentiate Army occupations?
3. How well do SME and analyst ratings agree?
4. Are ratings on Army occupations similar in quality to ratings on civilian occupations?
5. Are Army occupational profiles similar to those for their civilian counterparts?
6. How well do O*NET's work requirements descriptors, particularly GWAs, cover Army job requirements?

Addressing the first five questions required collection of ratings on the selected O*NET descriptors—abilities, skills, GWAs and WCs—for target Army occupations. Our approach was to produce data for the military occupations that could be compared to civilian O*NET data. Therefore, it was important to follow processes currently used by O*NET for data collection. For O*NET, job incumbents provide ratings on occupational tasks, skills, GWAs, and work context areas. Ability ratings for occupations are collected from trained analysts. Analysts have also been trained to rate skills, although those data have been used only experimentally until recently. Accordingly, we collected skill, GWA, and work context data from SMEs for each target Army occupation. We collected analyst ratings on the abilities and skills for target Army occupations, following the procedures used in collecting O*NET analyst ratings for *SOC* occupations (Donsbach et al., 2003). In the O*NET analyst training, analysts rate occupations using a standard set of descriptive materials—tasks for the occupation and incumbents' ratings of those tasks, GWAs, and work context descriptors. To use a parallel approach in the evaluation, we developed task lists for the target Army occupations. In sum, we collected task, skill, GWA, and work context ratings from SMEs and ability ratings from analysts. To allow comparison of SME and analyst data, we also asked SMEs to rate abilities and analysts to rate skills.

The sixth question required somewhat different data. If O*NET GWAs appeared to be related to or “cover” all or many of the Army job requirements that cut across occupations, here called Major Duties (MDs), then they would seem to be quite useful for providing a higher-order description of Army occupations (i.e., one that would encompass the major duties performed in the Army). If not, additions or revisions to the GWAs might be needed. In preparation for this assessment of coverage, we developed a list of MDs based on prior research and obtained feedback on it from Army SMEs. To make this evaluation, we asked non-incumbent raters to rate the degree to which each MD was “covered” by each GWA, with no occupation specifically identified (i.e., the MD might be imagined to be a part of any of several occupations; no particular occupation was implicated). Findings for the six questions were discussed at the end of Chapters III and IV.

In this chapter we summarize results and make recommendations regarding each descriptor set. These recommendations have to be tempered with some caveats. First, four officer and four enlisted occupations – out of hundreds of Army occupations – were included in the research; clearly that limits the strength of our conclusions. Also, our research design (by necessity) did not allow us to fully cross raters and occupations. (This would have required SMEs to rate occupations other than their own.) Thus, we cannot fully assess rater effects. Also, we limited the descriptors we considered to ones likely to be useful for selection and classification purposes; we cannot draw conclusions about O*NET's other descriptor sets such as Work Styles. Finally, because we focused on selection and classification, we cannot draw conclusions about the usefulness of O*NET for other purposes such as training needs assessment.

Abilities

Summary of Ability Results

The O*NET abilities were designed to cover the full range of individual differences in ability that have been studied over last century, and they were derived from both military and civilian studies (Fleishman et al., 1999). While one could argue about different taxonomic systems (e.g., Fleishman's physical abilities as opposed to the one developed by Hogan (1991), it would be very difficult to argue that the abilities do not capture the range of replicable, stable individual differences reported in the literature.

The O*NET analyst training package appears to work fairly well. Results presented in Chapter III suggest that trained analysts make reliable ability ratings. With some training, SMEs might do so as well, albeit SMEs are likely to take issue with the lack of Army-specificity in the anchors. We also found that trained project and O*NET analysts were able to rate the abilities with about the same level of agreement and reliability observed for O*NET analyst ratings of civilian occupations.

We also found that ability level ratings show appropriate convergence and divergence for enlisted occupations. That is, the correlation between occupations on abilities was low relative to the correlations among different rater types. This suggests that the abilities would provide a useful basis for distinguishing jobs for classification purposes. We did, however, find that project analysts drew more distinctions than O*NET analysts. This suggests that trained analysts should be ones who know something about Army jobs. We also found that the abilities were less distinguishing for officer occupations, but it is possible that officer occupations are truly more similar to each other than enlisted ones are, since officers have common responsibilities regardless of occupation.

Finally, when we applied the multi-trait, multi-method approach to assess the convergence/divergence of Army and SOC data, we found that Army occupations correlated most highly with their SOC counterparts (mean $r = .73$); they did not correlate as highly with non-counterpart occupations (mean $r = .41$).

Ability Descriptor Recommendations

- *Use O*NET ability questionnaires “as is” or close to it.* In all, the O*NET abilities yield reliable ratings that show both convergent and divergent validity. Retaining the level anchors and descriptors “as is” would allow direct comparison with civilian occupations in the SOC.
- *Consider developing a pool of Army O*NET analysts to make ability ratings.* Based on our data, trained analysts who have some experience with Army jobs are likely to provide the most useful judgments. The process O*NET uses for training raters and obtaining data appears to work well. Furthermore, the process is efficient: trained analysts can rate the abilities and skills for an occupation in less than two hours and can be asked to rate large numbers of occupations in a reasonably short amount of time. If SMEs were to make ability ratings (a) they would need training and (b) additional Army-specific anchors might need to be added to the level scales. Given that SME time is very precious and at times hard to obtain, using trained analysts would appear to be the better alternative.
- *Link the O*NET ability taxonomy to predictor variables of interest.* One useful addition might be to conduct a linkage exercise mapping existing and experimental predictors (e.g., ASVAB subtests and other measures, such as the Army’s experimental psychomotor tests) to the O*NET abilities taxonomy. This might provide a route to investigating occupation clusters based on those predictors.

Skills

Summary of Skill Results

All rater types rated skills very reliably, and there were no large differences in the magnitude of ratings made by different rater types on skills. When all eight occupations were considered, the skill ratings showed differentiation across occupations. That differentiation diminished when we looked within enlisted and officer occupations, most of the differentiation probably resulting from differences between officer and enlisted occupation skill level requirements. Skill level means were considerably lower, on average, for entry-level enlisted jobs than for entry-level officers; it makes sense that higher levels of skills are more likely to come into play as Soldiers move up the ranks. As with the abilities, Army occupations were more highly correlated with counterpart SOC occupations than non-counterpart occupations, another piece of evidence supporting skill rating validity.

Skill Descriptor Recommendations

Our recommendations for the skill descriptors are not as clear cut as they were for the abilities. While the skill ratings were of high quality, they did not well discriminate among our small sample of enlisted occupations. This could be a function of the number and type of occupations included in the current research. Therefore, one recommendation is to collect

O*NET skill data for additional occupations. It might also be useful to collect the skill ratings for SL1, SL2, and SL3 to see how well skills might differentiate level.

Two additional avenues warrant further exploration:

- *Assess the utility of using skill level data to guide promotion tool development.* The skills showed promise for distinguishing among skill levels. The Army has been seeking efficient ways to develop promotion measures and perhaps skill level information could form a basis for measure development (e.g., promotion tools would be targeted toward levels on skill scales instead of creating new promotion instruments for each occupation).
- *Consider potential uses of skill ratings for officer development.* Several of the skill descriptors deal with managerial duties. It could be useful to present data collected from this project to individuals responsible for designing the Basic Officer Leader Course (BOLC I and II) and get their input as to the potential usefulness of the skill descriptors for the officer ranks.

Work Context

Summary of Work Context Results

While the empirical data for the work context variables were strong (e.g., SMEs rated them reliably, they differentiated jobs), verbal reports from the SME workshops suggested areas in which the work context descriptors might be improved.

Work Context Descriptor Recommendations

One consistent theme in SME workshops had to do with large differences between in-garrison and deployment contexts. Our observation is that this had its greatest effect on (a) work-oriented descriptors (i.e., GWAs, work context, and, in particular, KWAs), and (b) specific rating scales (e.g., frequency scales with absolute anchors). Handling this issue will require further study. It is not a simple matter of adding a deployed versus in-garrison scale. We have learned that over the course of current operations in Iraq and Afghanistan that work-related requirements can vary considerably, both over time and within the same country depending on duty location. We recommend research to develop an efficient set of deployment-context descriptors.

One possibility would be to develop a set of 5-10 descriptors that characterize the main features of the mission context. Years ago, a U.S. Army Special Forces (SF) general told the first author of this report that there were basically two kinds of SF work: (a) door kicking and (b) well-digging—and that Soldiers who were good at one were not necessarily good at the other. It may be that at the broadest level there are two dimensions: direct action and diplomatic/aid. The key is to determine what descriptors distinguish these contexts. For example, the level of interaction/cooperation with foreign nationals or indigenous people would seem to be one distinguishing factor. One method of developing mission profiles would be to ask Soldiers to rate

different missions using the O*NET work context variables. This could illuminate what descriptors distinguish missions.

To be useful, such research would need to concisely and accurately define a very limited number of such descriptors, and, most crucially, demonstrate that they have a moderating effect on the ratings made on the other sets of descriptors thought to be affected by these larger contextual factors (i.e., the GWAs, KWAs, and the other context descriptors). Also some thought needs to go into how these descriptors, once defined, would be used.

Based on comments from SMEs in the workshops, possible additions to the descriptor set include the following:

- *Work Pace.* One WC item asks how important is it to keep a pace set by machinery or equipment. It prompted a discussion about how work pace varies for combat and non-combat activities. During battle, the pace is influenced by available technology as well as other factors (e.g., own and enemy troop strength).
- *Working with little sleep.* A discussion about long work hours that Soldiers keep during deployments also prompted a discussion about sleep deprivation. SMEs said that sleep deprivation affects the mission and is influenced by the mission. It appears that junior officers, in particular, often operate with very little sleep. It would seem that working with little sleep could be an important context element to capture.
- *Communicating with indigenous people, host nation counterparts, peers and superiors.* Another theme that tended to come from officers had to do with communications. During deployments, junior officers have been assigned to work with host nation counterparts (e.g., Iraqi junior officers) and to negotiate with indigenous leaders about activities and resources. While much of the negotiation takes place through an interpreter, it is still a challenge to deal with the cultural differences in the negotiation. The junior officer SMEs also thought it could be useful to add WC items that reflect their need to persuade or influence their peers or superiors.
- *Travel, overseas travel, and extended time away from home.* SMEs mentioned that items could deal with being separated from one's normal environment (e.g., in a foreign country) for an extended period of time.
- *Lifting heavy weight.* Some SMEs felt that lifting heavy weight was not sufficiently covered in the WC items.

SMEs suggested that Army examples could be added to some items to make them clearer. For some items this could be done without disturbing the content of the item. For example, a WC item about protective gear could add examples of combat gear to the list of civilian gear in that item. This kind of change could be useful if SMEs were to make ratings on the work context scales operationally.

GWAs

Summary of GWA Results

Our data suggest that if the Army were to collect GWA ratings from about 15 to 18 SMEs for each occupation, a recommended multi-rater reliability of .80 would be achieved. The data also suggest that those GWA ratings would differentiate occupations (Table 12 and Table 13). The convergent correlations between Army occupations and *SOC* counterparts, in conjunction with the divergent correlations between Army and non-counterpart occupations, provide additional support for the convergent and divergent validity of the GWA ratings made by SMEs.

The task of assessing the coverage of MDs by GWAs yielded some surprises. Based on the criteria we imposed, 67 of the 87 MDs had “Full” coverage, five had “High Partial” coverage, 11 had “Low Partial” coverage, and four were not covered. Interestingly, the 15 with low partial or no coverage were not necessarily Army-specific. We grouped them as follows:

Trades-Related:

- Install and maintain electrical and power transmission systems
- Repair metal structures or parts
- Construct metal or steel structures
- Install, maintain, and repair plastic and fiberglass
- Install, maintain, and repair pipe assemblies

Hazard/Combat Related:

- Fire direct fire weapons
- Protect against NBC hazards
- Maintain personal and operational security

Team-Related:

- Help peers and individual team members
- Monitor peer and individual team member performance
- Monitor team performance

Miscellaneous:

- Operate electronic equipment
- Prepare food and beverages
- Follow orders and rules

GWA Descriptor Recommendations

Several approaches could be used to remedy areas with lack of coverage. They are: (a) add several new specific GWAs; (b) add only a few broad GWAs; or (c) expand the definitions of existing GWAs to include the uncovered MDs. We prefer adding new GWAs over modifying existing ones, because the comparability to O*NET would remain preserved if GWAs were simply added and not changed, and that comparability could serve the Army well in the future.

Specifically, we recommend adding *one or more Army-specific GWAs for the Hazard/Combat Related grouping and/or for the Team-Related grouping*. If this were undertaken, then other MDs having similar content to these two groupings might be identified to inform the development of such GWAs. Conversely, the Miscellaneous grouping represents a hodge-podge: “Operate electronic equipment” could be its own GWA, as perhaps could “Prepare food and beverages.” “Follow orders and rules”, however, does not seem like an activity in the sense of the other MDs and might best be modeled as a work style requirement.

A Vision for the Future

Given what we have learned, we are optimistic about the relatively rapid development and implementation of an Army-specific occupational analysis system that:

- incorporates “as is” the ability and skill domains of O*NET
- makes a limited number of “improvements” by adding key descriptors to the O*NET GWAS and Work Context domains, along the lines outlined above
- most crucially, includes a fully-developed and refined domain of Key Work Activities, organized into higher-order Major Duties
- uses a cadre of trained analysts to make the Ability and Skill ratings (the standard O*NET training given to either experienced Army SMEs or Army scientists would be sufficient)
- uses samples of 15 to 30 SMEs to make the GWA and Work Context ratings for each Army occupation

This system would provide an extremely useful “common language” occupational analysis system for the Army with strong links to the civilian occupational database. Such a link has obvious benefits for recruitment and rapid mobilization efforts. Selection and classification applications should flow directly from such a system as described in Campbell et al, 2006 and training and development needs could be met with a linkage of specific occupational tasks to KWAs and, hence, to Major Duties, as we briefly described in Chapter II. Opportunities for efficiencies in training and development applications would seem much easier to identify with such a system, as would the definition and development of job performance criteria linked to KWAs and MDs.

VI. References

- Brady, E. (2004). *Occupational analysis in the United States Army: Past and present*. A paper presented at the 46th Annual Conference of the International Military Testing Association in Brussels.
- Campbell, D.T. & Fiske, D.W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56, 81-105.
- Campbell, J. P., McCloy, R. A., Morton, S. M., Pearlman, K., Peterson, N., Rounds, J., & Ingerick, M. (2006). *U.S. Army Classification Research Panel: Conclusions and recommendations on classification research strategies* (DR-06-96). Alexandria, VA: Human Resources Research Organization.
- Committee on Techniques for the Enhancement of Human Performance: Occupational Analysis (1999). *The changing nature of work: implications for occupational analysis*. Washington, DC: National Academy press.
- Donsbach, J. Tsacoumis, S., Sager, C., & Updegraff, J. (2003). *O*NET analyst occupational abilities ratings: procedures* (FR-03-22). Alexandria, VA: Human Resources Research Organization.
- Dunnette, M.D. (1999). Introduction. In N.G., Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, & E.A. Fleishman (Eds.) *An occupational information system for the 21st Century: The development of O*NET*. Washington, DC: American Psychological Association.
- Dye, D. & Silver, M. (1999). The origins of O*NET. In N.G., Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, & E.A. Fleishman (Eds.) *An occupational information system for the 21st Century: The development of O*NET*. Washington, DC: American Psychological Association.
- Fleishman, E.A., Costanza, D. P., & Marshall-Mies, J. (1999). Abilities. In N.G., Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, & E.A. Fleishman (Eds.) *An occupational information system for the 21st Century: The development of O*NET*. Washington, DC: American Psychological Association.
- Fleishman, E.A., & Quaintance, M.K. (1984). *Taxonomies of human performance: The description of human tasks*. New York: Academic Press.
- Hogan, J. C. (1991). Physical abilities. In M. D. Dunnette & L. M. Hough (Eds.), *Handbook of Industrial and Organizational Psychology* (Vol. 2, pp. 753-831). Palo Alto, CA: Consulting Psychologists Press

- Ingerick, M. (2007). *Army job analysis projects: Working recommendations and blueprint for prototyping Army job descriptors and metrics*. Alexandria, VA: Human Resources Research Organization.
- Jeanneret, P.R., Borman, W.C., Kubisiak, U.C., & Hanson, M.A.. (1999). Generalized work activities. In N.G., Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, & E.A. Fleishman (Eds.) *An occupational information system for the 21st Century: The development of O*NET*. Washington, DC: American Psychological Association.
- McCloy, R., Waugh, G., & Medsker, G. (1998). *Determining the occupational reinforcer patterns for O*NET occupational units*. Alexandria, VA: Human Resources Research Organization.
- McGraw, K. O. & Wong, S. P. (1996). Forming inferences about some intraclass correlations coefficients. *Psychological Methods*, 1, 30-46.
- Mumford, M.D., Peterson, N.G., & Childs, R.A. (1999). Basic and cross-functional skills. In N.G., Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, & E.A. Fleishman (Eds.) *An occupational information system for the 21st Century: The development of O*NET*. Washington, DC: American Psychological Association.
- Nunnally, J.C. (1967). *Psychometric Theory*. New York: McGraw-Hill
- Peterson, N.G., Owens-Kurtz, C., Hoffman, R.G., Arabian, J.M., & Whetzel, D.L. (1990). *Army synthetic validity project: Report of Phase II Results: Volume I* (TR #892). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Peterson, N.G., Mumford, M.D., Borman, W.C., Jeanneret, P.R., & Fleishman, E.A. (1999). *An occupational information system for the 21st Century: The development of O*NET*. Washington, DC: American Psychological Association.
- Russell, T.L., Mumford, M.D., & Peterson, N.G. (1996) *Applicability of the Department of Labor's O*NET for Army occupational analysis*. ARI Research Note 96-68. Alexandria, VA.
- Russell, T.L., Sinclair, A., Erdheim, J., Ingerick, M., Owens, K., Peterson, N., & Pearlman, K. (2008). Supplemental Appendices for Evaluating the O*NET Occupational Analysis System for Army Competency Development. ARI Research Note [in Review]. Alexandria, VA.
- Sackett, P. R., & Laczo, R. M. (2003). Job and work analysis. In W.C. Borman, D. R. Ilgen, and R.J. Klimoski (Eds.) *Comprehensive Handbook of Psychology*, Volume 12: Industrial and Organizational Psychology. New York: John Wiley & Sons.
- Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*, 86, 420-428.

- Strong, M.H., Jeanneret, P.R., McPhail, S.M., Blakley, B.R., & D'Egidio, E.L. (1999). Work Context: Taxonomy and Measurement of the Work Environment. In N.G., Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, & E.A. Fleishman (Eds.) *An occupational information system for the 21st Century: The development of O*NET*. Washington, DC: American Psychological Association.
- Society for Industrial and Organizational Psychology, Inc. (2003). *Principles for the validation and use of personnel selection procedures*. Bowling Green, OH: author.
- Tsacoumis, S. (2007). *The feasibility of using O*NET to study skill changes*. A paper prepared for the Workshop on Research Evidence Related to Future Skill Demands, Center for Education, The National Academies.
- Willison, S., Byrum, C.N., Tsacoumis, S. (2007). *O*NET analyst occupational abilities ratings: Analysis cycle 7 results* (HumRRO DFR 07-02). Alexandria, VA: Human resources Research Organization.

APPENDIX A

The Feasibility of Using O*NET to Study Skill Changes (Tsacoumis, 2007)

The Feasibility of Using O*NET to Study Skill Changes

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Prepared for the
Workshop on Research Evidence Related to Future Skill Demands
Center for Education
National Research Council
May 31-June 1, 2007

Introduction

The Occupational Information Network (O*NET) is a comprehensive system developed by the U.S. Department of Labor that provides information for 812 occupations within the U.S. economy. This information is maintained in a comprehensive database which was developed to replace the Dictionary of Occupational Titles (DOT) (U.S. Department of Labor, 1991). The DOT, which was first published by the Department of Labor in 1939, provided information on 12,000 occupations. The information was collected by observing and interviewing job incumbents, much of which occurred during the 1970s. In the late 1980s, the Employment and Training Administration (ETA) of the U.S. Department of Labor embarked on a review of the DOT. This review was aimed at assessing the costs and problems associated with maintaining the information. As part of this review, in 1990 the Secretary of Labor appointed an Advisory Panel on the DOT (APDOT). This group recommended developing an electronic database to house occupational information, collecting information on additional types of job descriptors, and relying, primarily, on surveys to collect the requisite data. In addition, APDOT noted the importance of implementing timely updates and maintenance of the database. Based upon these recommendations, O*NET was created.

O*NET Content Model

The O*NET system is based upon the O*NET Content Model, which provides a framework for classifying, organizing, and structuring O*NET data. The components of the Content Model were developed based on a thorough review of an extensive body of literature from the job analysis arena within the field of industrial/organizational psychology (e.g., Fleishman, 1992; Lubinski & Dawes, 1992). The research team synthesized the available information and identified a taxonomy of variables to serve as the foundation of the Content Model (Peterson, et al., 1995, Peterson, 1997, & Peterson, 1999). Since its inception, the Model has been reviewed and evaluated, as a result, slightly revised. In general, the Content Model contains four types of descriptors: job-oriented, worker-oriented, cross-occupational, and occupation-specific. In turn, these descriptors are organized into the six domains shown in Figure 1 and described below.

The six Content Model domains are:

- **Worker Characteristics**—enduring characteristics that may influence both performance and the capacity to acquire knowledge and skills required for effective work performance. Included in this domain are:
 - **Abilities:** enduring attributes of the individual that influence performance.
 - **Occupational Interests:** Preferences for work environments and outcomes. Occupational Interest Profiles (OIPs) are compatible with Holland's (1997) model of personality types and work environments.
 - **Work Values:** Global aspects of work composed of specific needs that are important to a person's satisfaction. Occupational Reinforcer Patterns (ORPs) are based on the Theory of Work Adjustment (Dawis & Lofquist, 1984).
 - **Work Styles:** personal characteristics that can affect how well someone performs a job.

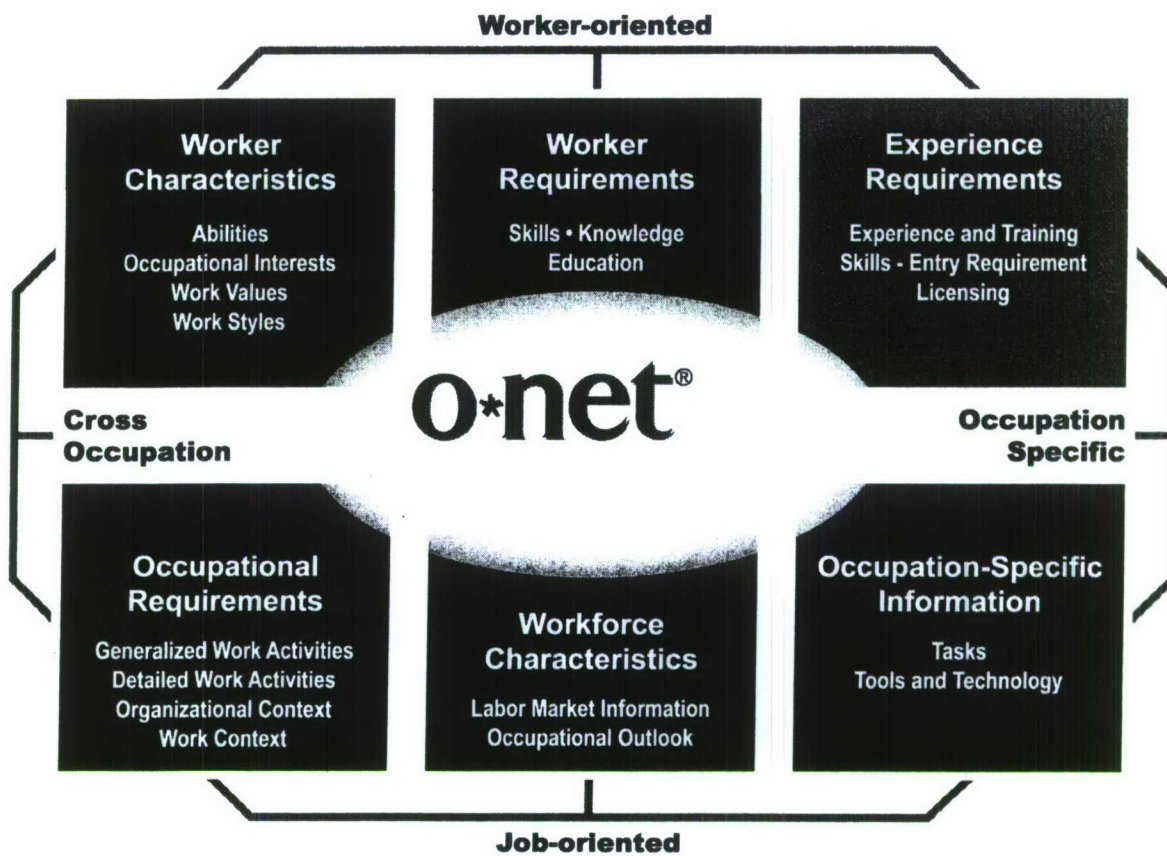


Figure 1. O*NET Content Model

- **Worker Requirements**—work-related attributes that are acquired and/or developed through experience and education. Included in this domain are:
 - Basic Skills: developed capacities that facilitate learning and information acquisition.
 - Cross-functional Skills: developed capacities that facilitate performance of activities that occur across jobs.
 - Knowledges: Organized sets of principles and facts applying in general domains.
 - Education: Prior educational experience required to perform in a job.
- **Experience Requirements**—requirements that are explicitly linked to certain types of work activities. This domain includes:
 - Experience and Training: The amount of work activity required in order to be hired to perform the target job.
 - Basic Skills – Entry Requirement: The skills required to be hired for a job; these skills facilitate learning or the more rapid acquisition of knowledge.
 - Cross-functional Skills – Entry Requirement: The skills required to be hired for a job; these skills facilitate performance of activities that occur across jobs.
 - Licensing: Licenses, certificates, or registrations that are awarded to show that a job holder has gained certain skills. This includes requirements for obtaining these credentials, and the organization or agency requiring their possession.

- **Occupation Requirements**—variables or detailed elements that describe specific occupational requirements. Included in this domain are:
 - Generalized Work Activities: general types of job behaviors occurring on multiple jobs.
 - Work Context: physical and social factors that influence the nature of work.
 - Detailed Work Activities: detailed types of job behaviors occurring on multiple jobs.
 - Organizational Context: Characteristics of the organization that influence how people do their work.
- **Workforce Characteristics**—variables that define and describe the general characteristics of occupations that may influence occupational requirements (labor market information, occupational outlook).
- **Occupation-Specific Information**—variables or other elements (tasks, tools and technology) that apply to a single occupation or a narrowly defined job family.

Within each Content Model domain, information is organized by different levels of description. The hierarchical structure of the Content Model can be thought of as a staircase that leads O*NET users to the specific level of worker- or job-related information needed for their particular purpose. Information on 277 descriptors is gathered as part of the O*NET program and even more data is collected by other federal agencies (e.g., Bureau of Labor Statistics).

Occupational Structure

As noted above, the Content Model provides the informational framework for an occupation. The organizational schema for all occupations is provided by the O*NET-SOC taxonomy which is based on the Standard Occupational Classification (SOC, U.S. Department of Labor, Bureau of Labor Statistics (2004). The initial taxonomic system was based on an Occupational Employment Statistics classification (O*NET OU 1998). However, in 2000, the Office of Management and Budget (OMB) required all government agencies to collect occupational data based on the SOC. As such, O*NET underwent a major revision which resulted in the O*NET SOC 2000 (Levine, et. al., 2000). This change was followed by another update that resulted in the O*NET-SOC 2006 (National Center for O*NET Development, 2006b). Additional modifications to the taxonomy are planned when New and Emerging (N&E) occupations are added (National Center for O*NET Development, 2006a). Currently, research is being conducted on high growth industries to identify potential new and emerging occupations. When this research is complete, these additional occupations will be added to the taxonomy.

During the revision process, it was paramount to identify a taxonomy that would permit the collection of data at an appropriate level of specificity and would reflect the changing nature of work in light of new technologies and innovative business practices (National Center for O*NET Development, 2006b). In a large majority of the cases, the O*NET SOC is identical to an occupation in the SOC. In other cases, the O*NET-SOC is more detailed than the original SOC occupation.

There were five types of modifications that occurred during the 2006 revisions to the taxonomy:

1. Detailed O*NET-SOC occupations were aggregated to the SOC-level occupation.
 2. Two or more detailed O*NET-SOC occupations were aggregated into a new detailed O*NET-SOC occupation.
 3. Detailed O*NET-SOC occupations were subsumed by an existing detailed O*NET-SOC occupation.
 4. Detailed O*NET-SOC occupations were subsumed by a SOC-level occupation.
 5. Detailed O*NET-SOC occupations were added to the taxonomy.
- (National Center for O*NET Development, 2006b)

As a result, the new occupational taxonomy includes 949 titles, 812 of which represent data-level occupations. That is, the O*NET program is collecting updated data for these 812 occupations. The remaining occupations include military occupations, “all other” occupational titles, and SOC’s which are broken down into more detail in O*NET. No data will be collected on these 137 occupations; they will remain in the system by title only.

For users of previous classification systems, including the DOT, Classification of Instructional Program (CIP), Military Occupational Classification (MOC), and Registered Apprenticeship Information System (RAIS), the National Crosswalk Service Center has created and maintains comprehensive crosswalks, which are available at the following link: http://www.onetcenter.org/supplemental.html#ncsc_xwalk. Crosswalks between the O*NET-SOC 2000 and O*NET-SOC 2006 can be found at <http://www.onetcenter.org/taxonomy.html#listings>. All crosswalks are straightforward, effective, and current.

Data Collection and the O*NET Database

The O*NET data collection program is a continual process aimed at identifying and maintaining current information on the characteristics of workers and jobs. The carefully designed methodology has received clearance from the Office of Management and Budget (OMB), a testament to the rigor and quality of the work (for the recent OMB clearance packet, see http://www.onetcenter.org/dl_files/omb2005/Supporting_Statement2.pdf).

The information that populates the O*NET database is collected from four primary sources: legacy analysts, incumbents, occupational experts, and analysts. The data collection process can be divided into three broad phases: analyst, update, and in-demand. Initially, ratings were obtained from occupational analysts using DOT information on a set of descriptors. This yielded the first database – O*NET 98 - which contained 1,222 Occupational Units that were based on BLS OES codes. Then, as previously noted, the occupational taxonomy was modified to be more consistent with the SOC. O*NET 4.0 includes the ratings of the 900+ occupations in the O*NET-SOC 2000 and represents the final release of “analyst ratings only” data. This database is referred to as the Analyst database.

Moving into the Update Phase, subsequent databases have included additional descriptor information and have reflected input from incumbents as well as analysts. Beginning in June 2001 and continuing to-date, the full-scale data collection effort relies on incumbent participation

and involves updating all occupational information. Prior to implementing the new procedures, the U.S. Department of Labor and the National O*NET Consortium conducted extensive research to identify the most effective methodology for surveying incumbents. Of particular interest was an investigation of the impact alternative approaches had on response rates. The resulting methodology included the following two key features:

1. identifying a statistically random sample of businesses likely to have employees in the target occupations, and
2. selecting a random sample of employees in those occupations within those businesses.

The targeted incumbents provide ratings on occupational tasks, skills, generalized work activities, knowledge, education and training, work styles, and work context areas. Clearly, asking each respondent to provide judgments on *all* of these elements would be quite burdensome. Therefore, with the exception of the task questionnaire and demographic questions which all raters receive, the questions are divided among four different questionnaires which are randomly assigned to the sampled incumbents.

Importance and level information regarding the abilities associated with these occupations is being collected from trained analysts who rely on updated occupational information provided by job incumbents. It should be noted that there are theoretical or philosophical reasons for preferring one rater group to the other for collecting different types of data. For example, incumbents are generally more familiar with the day-to-day duties of their job; therefore, they are the best source of information regarding tasks and GWAs. In contrast, it is likely that trained analysts understand the ability constructs better than incumbents and therefore should provide the ability data. Although not published yet, data for the new and emerging (N&E) occupations are being collected from occupational experts.

The results of the data collection efforts during the Update Phase have yielded high quality data from a national sample of job incumbents. There is strong participation from both businesses and employees, with over 70% and 66% response rates, respectively. In addition, more than 400 national associations have endorsed O*NET. All ratings are carefully analyzed (e.g., reliability, inter-rater agreement, standard errors of the mean) in order to evaluate the quality of the data. These data checks provide invaluable information regarding the O*NET methodology and constructs and facilitate the continual review and improvement of the system as a whole.

At the completion of the Update Phase, the focus will shift to collecting data from “in-demand” occupations. These include industries that are economically critical, are projected to add substantial numbers of new jobs, or are being impacted by technology and innovation.

The O*NET database contains the information associated with the Content Model. It should be noted that there also are supplemental data files available. These include:

- **Detailed Work Activities:** statements that relate to work content within a Generalized Work Activity.
- **New Emerging Tasks:** tasks that were listed by incumbents during the survey process as being omitted from the existing task list were identified as emerging tasks.
- **Lay Titles:** a list of alternate occupational titles for O*NET occupations derived from job incumbents, transactional analyses, and other governmental agencies (e.g., BLS, Census).

- **Related Occupations:** identified based on a complex, comprehensive algorithmic formula, based on relatedness among selected O*NET characteristics.
- **Tools and Technology (T2):** provides information on machines, equipment, tools, and software that workers may use for optimal functioning in a high performance workplace. The information is not exhaustive.

Currently, O*NET releases updated databases twice a year. The first update based on the new data collection procedures (Update Phase) was O*NET 5.0, which was released in April 2003. This database included updated and new information for 54 occupations, based on the O*NET-SOC 2000. Specifically, the new data includes ratings of task statements and information on work context, work styles, training and work experience, and education. In addition, the abilities, work activities, knowledge, skills, job zone, and work context data were updated. Supplemental modifications included an update of the emerging occupational tasks and the addition of detailed work activities and tools and technology.

Subsequent database releases, which occur regularly at six month intervals, include a comprehensive update of approximately 100 occupations for each release. O*NET 10.0 was the first database to contain the O*NET-SOC 2006 taxonomy. The most recent version, O*NET 11.0, is the seventh update of the database from the Data Collection Program and it contains updated data on 680 occupations.

The O*NET database is a very flexible tool. For example, one can start with a skill or ability profile and identify occupations with similar profiles. As another option, one may start with an occupation and search to find other occupations with similar characteristics. If the user enters a previous occupation code or title, O*NET OnLine automatically redirects the user to its current equivalent. The database is structured according to the Content Model and can be downloaded as a flat file from the O*NET Center (www.onetcenter.org) or in Microsoft Access, Visual FoxPro, or SAS/PC versions. Examples of specific data in O*NET include mean importance and level-based ratings for various items (or descriptors), and text information on occupational definitions, descriptor definitions, scale anchors, and task descriptors. All information is available in a series of files or tables. The following Access tables contain data for the various currently available O*NET descriptors:

- Abilities
 - Interests
 - Work Values
 - Work Styles
 - Skills
 - Knowledge
 - Education, Training, and Experience
 - Work Activities
 - Work Context
 - Tasks
 - Occupation Data (definitions)
 - Job Zones
- (National Crosswalk Service Center, 2006)

Uses of O*NET Data

Information contained within O*NET is used by a wide audience that includes businesses, job-seekers, educators, students, counselors, and researchers. The O*NET database serves as the foundation for O*NET OnLine, Career Exploration Tools, and Code Connector. O*NET OnLine is an interactive application for exploring and searching occupations. It helps people get a sense of the type of worker and job information that is available through O*NET, and provides a basic tool for accessing the information directly. From that point, one can request customized information about a particular occupation or search an entire O*NET-SOC. Alternatively, one can search across occupations. Job seekers may find the Skills Search particularly useful. As noted previously, it is also possible to convert other classifications to the O*NET-SOC taxonomy by using the Crosswalk. O*NET OnLine is updated whenever information from job incumbents and analysts becomes available.

The O*NET Career Exploration Tools include several computerized assessments that introduce users to a range of career options. These tools include the: Ability Profiler, Interest Profiler, Computerized Interest Profiler, Work Importance Locator, and Work Importance Profiler. A third O*NET application is the Code Connector, which greatly facilitates the process of interactive job coding.

In addition to the O*NET applications available through O*NET OnLine, many organizations use O*NET data to facilitate the design, implementation, and support of a variety of programs and systems. The U.S. Department of Labor's website contains a number of examples of how O*NET has been put "into action." A few examples of these applications include:

- West Virginia Rehabilitation Center is using O*NET to help transitioning students translate career dreams and "can-do" outlook into real jobs.
- A new book on unfocused kids discusses how O*NET can help these children
- Wisconsin Department of Workshop Development trains job center staff across the state on O*NET and O*NET OnLine so they can use the available tools on their job.
- Faculty and staff at Temple University Center for Professional Development in Career and Technical Education Center incorporate O*NET OnLine in their courses on program planning and evaluation, curriculum development, and cooperative education.

O*NET has also proven to be an invaluable source of data when trying to identify new and emerging skill needs. In response to the need for skilled 3-D computer artists and traditional animators in the multimedia and entertainment industries, California's Employment Development Department conducted an industry study using O*NET's survey data collection instruments along with other material. The results highlighted the gap between industry needs and the local labor market. In response, the local training and education initiatives were modified, in an effort to close that gap.

O*NET data are also relevant for various human capital management programs. For example, ability, skill, and experience information could be useful for employee selection purposes, whereas GWA and knowledge data are likely to be informative for training purposes. Furthermore, job evaluation systems could benefit from both GWA and work context information.

Economists and educational professional may also find relevant uses for O*NET. For example, O*NET data has been used to investigate the vulnerability of U.S. jobs to offshoring and to analyze the relationship between educational attainment and occupational competencies (e.g., knowledge, skills, abilities) (Uhalde, Strohl, & Simkins, 2006).

O*NET and Skills Demands

Given the characteristics of its occupational taxonomy and Content Model, O*NET is an ideal source to inform questions regarding future skills demands. In fact, a number of organizations and states already take advantage of O*NET data to project current skill supply and potential skill changes. Of particular relevance is the work done by the Projects Managing Partnership (PMP) which is a collaboration between (1) the U.S. Department of Labor, Employment and Training Administration (ETA); (2) the U.S. Department of Labor, Bureau of Labor Statistics (BLS); (3) the National Association of State Workforce Agencies (NASWA); and (4) the State Projections Workgroup (<http://dev.projectionscentral.com/index.html>). One component of this effort involves the implementation of the Skill Based Projections (SBP) tool. Using O*NET data (skills, abilities, and GWAs) and the target state/territory's short- and/or long-term occupational projections, SBP tool identifies the:

- current skill supply,
- projected demand, and
- potential skills gaps and replacement needs.

An example application of this is presented in *Illinois' Future Workforce: Will There be Enough Workers with the Right Skills?* (Ginsburg & Robinson, 2006). In this case, they found the following 15 job skills to have the largest projected shortages for all growing occupations in Illinois in 2012:

1. Reading comprehension
2. Active listening
3. Speaking
4. Writing
5. Critical thinking
6. Active learning
7. Instructing
8. Monitoring
9. Coordination
10. Learning strategies
11. Social perceptiveness
12. Time management
13. Judgment and decision-making
14. Complex problem identification
15. Mathematics

The Geo-Skills Profile (www.geoskillanalyzer.com, 2006) offers a slightly different example of using O*NET to project future skills. In this case the O*NET skills are coupled with data from BLS and the U.S. Census Bureau to analyze workforces, occupations, wage data, and skills in labor markets. Among the information it can generate is a report that depicts the skills

that drive the economy in the targeted geographic area, including each skill's density when compared to the United States.

Given the question about whether O*NET can provide information that would be useful in evaluating changes in skill demands, the short answer is yes. In fact, as noted above, organizations are taking advantage of the data associated with several of the descriptors (e.g., GWAs, abilities and skills) in the Content Model to evaluate the current and projected demands. In addition, it seems feasible to analyze the O*NET data in several other ways to adequately address this issue. For example, one could compare the occupational data from the Analyst Phase with data from the same occupations in the Update Phase. Recall that O*NET was initially populated with data provided by occupational analysts using DOT information rather than by incumbents. In addition, a few descriptors were added to the Content Model since the initial data collection phase. However, data on the most relevant elements (i.e., skills, abilities, and GWAs) is available at both points in time. The appeal of this type of analysis is that it allows for a comparison of skills for the same occupation from two different time periods. One potential issue is that the occupation taxonomies differed during the two data collection efforts, although the crosswalk between the two occupational structures would help overcome this issue. Nevertheless, a perfect one-to-one comparison for all occupations is impossible. Another consideration when conducting this type of analysis is that the sources of data are quite different. Although analysts provide the information for abilities in both cases, incumbents provide skill and GWA data in the updated database. Despite these limitations, the resulting data could prove quite informative.

Another set of analyses that could be considered involves evaluating the emerging trends across occupations in the current database regarding important skills/abilities/GWAs. O*NET 11.0 contains 680 occupations and within a few months O*NET 12.0 will be released with another 100 occupations. The occupations that are added with each new release of an O*NET database tend to be from a variety of occupational categories. Given this, these analyses could be cut several different ways. The skills/abilities/GWAs can be rank-ordered based on importance across all the occupations with updated data. Alternatively, similar analyses can be done by major occupational category to see if there are different cross-category trends. Since the data collection effort spans a number of years, one could look at annual trends. Each year, data is collected on approximately 200 occupations. Therefore, this run would be comparing the 200 occupations collected in 2003, with those collected in 2004, and then 2005, and so on. Obviously, one limitation of this type of analysis is that the nature of the occupations within a given year may be quite different than those in another year. In addition, 200 occupations may not be deemed sufficient. Even if the analyses focusing across years is abandoned, it would be telling to conduct a close evaluation of the cross occupational trends.

It seems as though it would also be informative to take advantage of the Occupational Employment Survey (OES) data collected by BLS. Since both the O*NET and OES databases adopted the same occupational structure, one could match information from the two sources to examine whether occupations requiring particular transferable skills have grown. Also, as the O*NET database continues to be updated, there will be opportunities to conduct more relevant analyses (e.g., time series), the most obvious being a comparison of the skills within the same occupation across time. Another analysis could involve using the OES and O*NET data to examine changes in occupational demands as well as changes in the number of individuals employed in those occupations.

Summary

O*NET is a rich source of occupational information that is based on a comprehensive Content Model containing a broad set of descriptors. The O*NET database is continually updated with information provided by a range of workers from each occupation. Given the wealth of O*NET data, the potential applications are endless. It appears as though one of the most prevalent uses for the information is career exploration and planning. As noted, O*NET can also inform many human capital management programs, such as selection, promotion, training and succession planning. In addition, O*NET data and reports are informative for educators, economists, sociologists, as well as other prominent fields in the workforce community.

It is clear that there is a wealth of information currently available in O*NET that can be used in a variety of ways to inform the current and future skill demands. As noted above, O*NET provides skills data. However, one should also be aware that as Pearlman (1997) points out, the term *skills* seems to connote a variety of different definitions. Given that, it may be advisable to consider other elements (e.g., abilities, GWAs) of the Content Model when evaluating the change in skills demands. The relevance of the element can be determined by the user based on their O*NET definition.

Obviously, most informative analyses to address this issue would revolve around comparing occupational data for the same set of occupations across time. It is unfortunate that, at this point, the only data available across two time periods are not entirely comparable. Yet, as described above, there are reasonable analyses that could be conducted to inform the potential changes in skill demands. In fact, a number of organizations are using O*NET data to answer this question. Then as the data collection effort continues, new occupational data will be available and analyses more directly related to the question can be conducted.

References

- Dawis, R.V., & Lofquist, L.H. *A psychological theory of work adjustment*. Minneapolis, MN: University of Minnesota Press.
- Fleishman, E.A. (1992). *Fleishman Job Analysis Survey (F-JAS)*. Bethesda, MD: Management Research Institute, Inc.
- www.geoskillanalyzer.com (2006). *GeoSkillAnalyzer*, Workforce Strategies, Inc.
- Ginsburg, R. & Robinson, D. (2006). *Illinois' future workforce: Will there be enough workers with the right skills?* www.stateofworkingillinois.niu.edu.
- Holland, J.L. (1997). *Making vocational choices: A theory of vocational personalities and work environments* (3rd ed.). Englewood Cliff, NJ: Prentice Hall.
- Levine, J., Nottingham, J., Paige, B., and Lewis, P. (2000). *Transitioning O*NET to the Standard Occupational Classification*. Raleigh, NC: National Center for O*NET Development. http://www.onetcenter.org/dl_files/TRreport_xwk.pdf
- Lubinski, D. & Dawis, R.V., (1992). Aptitude, skills, and proficiencies. In M.D. Dunnette & L.M. Hough (Eds.). *Handbook of Industrial-Organizational Psychology. Second Edition*. (pp. 1-59). Palo Alto, CA: Consulting Psychologists Press.
- National Center for O*NET Development (2006a). *New and emerging (N&E) occupations: Methodology development report*. Raleigh, NC: National Center for O*NET Development. http://www.onetcenter.org/dl_files/NewEmerging.pdf
- National Center for O*NET Development (2006b). *Updating the O*NET-SOC Taxonomy: Summary and Implementation*. Raleigh, NC: National Center for O*NET Development. http://www.onetcenter.org/dl_files/UpdatingTaxonomy_Summary.pdf
- National Crosswalk Service Center (2006). *O*NET Occupations Reference Guide*. Des Moines, Iowa: Iowa Department of Education. <ftp://ftp.xwalkcenter.org/download/onet10/ONET10UserGuide.pdf>
- Pearlman, K. (1997). Twenty-first century measures for twenty-first century work. *Transitions in work and learning: Implications for assessments*. The National Academies Press.
- Peterson, N.G., Mumford, M., Borman, W., Jeanneret, P., & Fleishman, E. (1995). *Development of prototype Occupational Information Network (O*NET) content model. (Vols. 1-2)*. Salt Lake City: Utah Department of Workforce Services.
- Peterson, N.G. (1997). *Occupational Information Network (O*NET) research and development*. Washington, DC: American Institutes of Research.
- Peterson, N., Mumford, M., Borman, W., Jeanneret, P., & Fleishman, E. (1999). *An occupational information system for the 21st century: The development of O*NET*. Washington, DC: American Psychological Association.
- Uhalde, R. Strohl, J., & Simkins, Z. (2006). *America in the global economy*. National Center on Education and the Economy.
- U.S. Department of Labor (1991). *Dictionary of occupational titles*. (Rev. 4th ed.). Washington, DC: U.S. Government Printing Office.
- U.S. Department of Labor, Bureau of Labor Statistics (2004). *Standard Occupational Classification (SOC) user guide*. Washington, DC. <http://www.bls.gov/soc/socguide.htm>

APPENDIX B

MDs Assigned to GWA Factors

Categorization of Major Duties within Generalized Work Activity Factors

		GWA Factor		
		Manual, Physical, and Technical Activities	Working With and Directing Others	Working with Information
Major Duty (MD)				
1	Protect against NBC hazards	X		
2	Handle demolitions or mines	X		
3	Engage in hand-to-hand combat	X		
4	Inspect and maintain weapons	X		
5	Fire direct fire weapons	X		
6	Troubleshoot and repair weapons	X		
7	Navigate from point to point	X		X
8	Maintain personal and operational security	X		
9	Provide emergency first aid	X	X	X
10	Scout and identify targets			X
11	Fire heavy direct fire weapons	X		
12	Fire indirect fire weapons	X		X
13	Drive track vehicles	X		
14	Install and maintain electronic equipment	X		
15	Troubleshoot and repair electronic equipment	X		
16	Install and maintain electrical and power transmission systems	X		
17	Troubleshoot and repair electrical and power transmission systems	X		
18	Install and maintain personal computers and peripheral equipment	X		X
19	Install and maintain computer networks	X		X
20	Troubleshoot and repair personal computers and computer networks	X		X
21	Operate electronic equipment	X		
22	Operate personal computers and networks			X
23	Record and document audiovisual information			X
24	Send and receive radio messages			X
25	Collect and decode electronic signals			X
26	Analyze electronic signals			X
27	Provide data processing and programming support			X
28	Produce maps, overlays, or range cards			X

Categorization of Major Duties within Generalized Work Activity Factors

		GWA Factor		
		Manual, Physical, and Technical Activities	Working With and Directing Others	Working with Information
Major Duty (MD)				
29	Provide technical direction and advice on communication networks and information systems		X	X
30	Translate foreign languages			X
31	Analyze intelligence data			X
32	Control individuals and crowds	X	X	
33	Collect information from and on individuals and groups		X	X
34	Inspect and maintain mechanical equipment	X		
35	Troubleshoot and repair mechanical equipment	X		
36	Operate gas and electric powered equipment	X		
37	Prepare and process forms			X
38	Maintain records and files			X
39	Write documents and correspondence			X
40	Monitor and control financial resources			X
41	Load and unload supplies	X		
42	Drive wheeled vehicles	X		
43	Drive water craft	X		
44	Inspect, store, and issue supplies	X		X
45	Order supplies and equipment			X
46	Manage and control traffic			X
47	Operate hand-operated power excavating equipment	X		
48	Operate heavy equipment	X		
49	Install, maintain, and repair plastic and fiberglass	X		
50	Repair metal structures or parts	X		
51	Construct metal or steel structures	X		
52	Install, maintain, and repair pipe assemblies	X		
53	Construct wooden buildings and structures	X		
54	Construct masonry buildings and structures	X		
55	Produce technical drawings and illustrations			X
56	Prepare food and beverages	X		
57	Prepare patients and equipment for medical procedures	X	X	
58	Provide medical treatment	X	X	X

Categorization of Major Duties within Generalized Work Activity Factors

		GWA Factor		
		Manual, Physical, and Technical Activities	Working With and Directing Others	Working with Information
Major Duty (MD)				
59	Schedule patients and medical services		X	X
60	Provide counseling and other interpersonal interventions		X	
61	Perform laboratory procedures	X		X
62	Collect and analyze weather and environmental data			X
63	Conduct land surveys			X
64	Deliver presentations		X	X
65	Reproduce printed materials	X		
67	Maintain physical fitness	X		
73	Follow orders and rules		X	
74	Contribute to team tasks		X	
75	Direct peers and individual team members		X	
76	Support peers and individual team members		X	
77	Train peers and individual team members		X	
78	Help peers and individual team members		X	
79	Monitor peer and individual team member performance		X	
80	Monitor team performance		X	
81	Contribute to team planning		X	X
82	Contribute to team coordination		X	
83	Plan and organize operations/missions and team tasks		X	X
84	Direct and motivate individual Soldiers		X	
85	Train and coach Soldiers		X	
86	Communicate information to Soldiers, peers, and superiors		X	X
87	Administer personnel actions and procedures			X
88	Manage and monitor operations/missions and team tasks		X	
89	Direct and lead platoons/squads/teams		X	
91	Support individual Soldiers		X	
92	Build and manage platoon/squad/team cohesion		X	
93	Engage and negotiate with host nationals and local leaders.		X	
94	Coordinate with other units and non-Army personnel		X	X
Total Number of MDs		42	29	37

Appendix C

Major Duty and GWA Definitions

Major Duty	Definition
1 Protect against NBC hazards	Uses protective clothing, masks, and decontamination equipment to protect self, others, equipment, and supplies from nuclear, biological, and chemical (NBC) hazards. Detects and monitors potential hazards using NBC detection equipment.
2 Handle demolitions or mines	Stores, places, charges, discharges, and disarms explosives, demolition devices, or mines.
3 Engage in hand-to-hand combat	Uses offensive and defensive maneuvers to combat and protect self and others from hostile individuals.
4 Inspect and maintain weapons	Checks, disassembles, assembles, cleans, lubricates, and adjusts weapons, including pistols, rifles, machine guns, hand grenades, and breechblocks.
5 Fire direct fire weapons	Aims, tracks, and fires individual weapons (e.g., rifles, pistols, machine guns, hand grenades) at designated targets. Prepares and loads weapon. Clears and unloads weapon. Arms and throws hand grenades.
6 Troubleshoot and repair weapons	Finds the cause of malfunctions in weapons using technical manuals, tools, and test equipment. After the cause of a problem in a weapon has been found, fixes it using the appropriate tools and necessary replacement parts by following directions in the weapon's technical manual.
7 Navigate from point to point	Reads and interprets maps, other navigational devices, and equipment (e.g., GPS) to locate position of self and others. Determines grid coordinates and directions. Moves from point to point in response to terrain features (e.g., or cover or concealment) battle conditions, and mission, with or without the aid of maps and other navigational equipment.
8 Maintain personal and operational security	Selects, prepares, and occupies individual tactical positions (e.g., battle positions, overwatch positions, observations posts), camouflages self and equipment, and observes security procedures.
9 Provide emergency first aid	Provide emergency first aid to individuals (e.g., CPR, put on field dressing, prevent shock).
10 Scout and identify targets	With or without optical devices and other equipment (e.g., night sights, weapon sights, binoculars), scouts and locates possible targets and their position(s). Identifies target's type (e.g., troops, tanks, aircraft) and intent (e.g., hostile or non-hostile).
11 Fire heavy direct fire weapons	Aims, tracks, and fires heavy direct fire weapon (e.g., tank main guns, TOW missile) at targets. Positions and loads weapons for firing. Unloads or extracts unused rounds or misfires.
12 Fire indirect fire weapons	Aims, tracks, and fires indirect weapon (e.g., field artillery, heavy mortars) by adjusting azimuth and elevation controls to hit designated targets. Positions and loads weapon for firing. Unloads or extracts unused rounds or misfires.
13 Drive track vehicles	Drives track vehicles (e.g., tank, APC, BFV, etc.) in response to mission, terrain, and traffic controls.
14 Install and maintain electronic equipment	Installs and connects electronic, communications, and satellite-based equipment (e.g., GPS, radios, antennas, satellite telephones, radar, missile and tank ballistics computer systems). Inspects and monitors equipment for operation. Conducts scheduled services to maintain equipment. (Does not include personal computers and computer networks.)

Major Duty	Definition
15 Troubleshoot and repair electronic equipment	Troubleshoots electronic, communications, and satellite-based equipment (e.g., GPS, radios, antennas, radar, missile and tank ballistics computer systems) to diagnose problems and malfunctions using specialized test equipment and manuals. Repairs equipment with the appropriate tools (e.g., test sets, screwdrivers, pliers, soldering guns) and necessary replacement parts by following directions in the equipment's technical manual. (Does not include personal computers and computer networks.)
16 Install and maintain electrical and power transmission systems	Installs and connects electrical and power transmission systems (e.g., electrical wiring, power cables, communications wiring). Lays, splices, and knots wires and cables using the appropriate tools (e.g., wire cutters). Inspects and monitors systems for operation. Conducts scheduled services to maintain systems.
17 Troubleshoot and repair electrical and power transmission systems	Measures and tests electrical and power transmission system components (e.g., generators, wiring harnesses, switches, relays, circuit breakers, wires, cables) to detect and diagnose problems and malfunctions using specialized test equipment and manuals. Repairs system components with the appropriate tools (e.g., wire strippers, pliers, soldering irons) and necessary replacement parts by following directions in the equipment's technical manual.
18 Install and maintain personal computers and peripheral equipment	Connects personal computers and peripherals, installs software, and connects to networks. Monitors computers and peripherals. Conducts scheduled services and upgrades to maintain computers and peripherals. (Does not include computer networks.)
19 Install and maintain computer networks	Installs and configures network hardware and software. Monitors network use and performance. Conducts scheduled services and upgrades to maintain network. (Does not include personal computers.)
20 Troubleshoot and repair personal computers and computer networks	Troubleshoots personal computer and network components (e.g., hard drive, monitors, keyboard, network router, network cables-wiring) to detect and diagnose problems and malfunctions using specialized test equipment and manuals. Repairs computer or network components with the appropriate tools (e.g., pliers, screwdrivers, wrenches) and necessary replacement parts by following directions in the equipment's technical manual.
21 Operate electronic equipment	Sets and adjusts the controls to operate electronic, communications, and satellite-based equipment (e.g., GPS, radios, antennas, satellite telephones, radar, missile ballistics controls), including tactical command and control systems (e.g., Force XXI Battle Command, Brigade-and-Below [FBCB2]).
22 Operate personal computers and networks	Operates and works with personal computers and networks to create and edit documents and presentations, store and enter data into databases, or to search for and process information. (Does not include programming).
23 Record and document audiovisual information	Records and documents visual and sound information for intelligence analysis, training, or documentation using audiovisual equipment (e.g., audio recorders, cameras, videotape, digital video).
24 Send and receive radio messages	Uses standardized radio codes and procedures to transmit and receive messages and other information.
25 Collect and decode electronic signals	Collects electronic signals and communications. Uses coding systems and rules to decipher and interpret coded information.

Major Duty	Definition
26 Analyze electronic signals	Analyzes electronic signals to detect threat transmitters and electronic countermeasures.
27 Provide data processing and programming support	Analyzes data processing needs. Selects or prepares, edits, tests, and runs computer programs. Documents process and results.
28 Produce maps, overlays, or range cards	Uses drafting, graphics, and related techniques to draw and revise maps of terrain, including locations of buildings and other objects, targets, avenues of approach, and maneuver areas from personal observation or available materials (e.g., aerial photographs).
29 Provide technical guidance and advice on the installation, maintenance, and use of equipment	Explains and demonstrates to Army and non-Army personnel at all levels how to install, maintain, and use equipment. Answers technical questions. Provides expert advice to others on issues related to the installation, maintenance, and use of equipment.
30 Translate foreign languages	Translates written or spoken foreign language communications.
31 Analyze intelligence data	Determines importance and reliability of information. Uses information to determine identity, capabilities, disposition, and movement of non-U.S. forces and personnel.
32 Control individuals and crowds	Performs guard duty, including challenge and password. Apprehends and searches suspected criminals, detainees, or prisoners. Guards and escorts detainees or prisoners. Participates in riot control.
33 Collect information from and on individuals and groups	Collects and gathers information from and on individuals and groups using a variety of techniques (e.g., interviews, focus groups, observations).
34 Inspect and maintain mechanical equipment	Inspects and monitors mechanical equipment (e.g., vehicles, trailers, generators, construction equipment). Conducts scheduled services to maintain equipment.
35 Troubleshoot and repair mechanical equipment	Troubleshoots mechanical system components (e.g., engines, transmissions, brakes, hydraulics, refrigeration systems) to diagnose problems and malfunctions using specialized test equipment and manuals. Repairs equipment using the appropriate tools (e.g., wrenches, screwdrivers, gauges, hammers, soldering equipment) and necessary replacement parts by following directions in the equipment manual.
36 Operate gas and electric powered equipment	Operates gas and electric powered equipment (e.g., electric generators, air compressors, smoke generators, quarry machines, mobile washing machines, water pumps) to produce power or process materials.
37 Prepare and process forms	Follows standardized procedures to prepare or complete forms and documents (e.g., personnel records, legal briefs, requisition requests, inspection records). Obtains required authorizations, as needed. Monitors and reviews forms for completeness.
38 Maintain records and files	Collects, sorts, indexes, files, and retrieves records and files (e.g., medical records, training rosters, personnel statistics, supply inventories, etc.).
39 Write documents and correspondence	Prepares and writes letters, reports, and memos. Proofreads and edits documents prior to distribution.
40 Monitor and control financial resources	Monitor and controls the expenditure of financial resources. Maintains and reviews accounting records. Disperses and collects money and money orders.

Major Duty	Definition
41 Load and unload supplies	Builds or assembles platforms, cushions, and riggings for supplies and equipment to protect from damage during transport. Loads and lashes materials onto transport vehicles (land, sea, or air) to secure and protect from damage or loss during shipment. Unpacks and unloads supplies after transport to designated location.
42 Drive wheeled vehicles	Drives wheeled vehicles over roads and cross-country in response to mission, terrain, and traffic regulations.
43 Drive water craft	Drives water craft (e.g., boats, rafts) in response to mission requirements and nautical regulations.
44 Inspect, store, and issue supplies	Inspects supplies and reviews paperwork upon receipt. Sorts and stores supplies. Issues or ships supplies to authorized personnel or units.
45 Order supplies and equipment	Determines supply and equipment needs or evaluates requests. Prepares and submits orders and requisitions for needed supplies and equipment.
46 Manage and control traffic	Manages and coordinates the departing, en route, arriving, and holding of traffic (land, air, or sea) by monitoring equipment, communicating with vehicles and other traffic control units.
47 Operate hand-operated power excavating equipment	Uses hand-operated power excavating equipment (e.g., air hammers and drills, paving breakers, grinders, backfill tampers) to build concrete, stone, or other structures.
48 Operate heavy equipment	Operates heavy equipment (e.g., fork lifts, cranes, back-hoes, and graders) to load, unload, or move other heavy equipment, supplies, construction materials (e.g., culvert pipe, building and bridge parts) or terrain (e.g., earth, rocks, trees, etc.).
49 Install, maintain, and repair plastic and fiberglass	Installs plastic or fiberglass parts and structures. Fixes plastic or fiberglass parts and structures by cutting, sawing, drilling, sanding, filling, gluing, and painting.
50 Repair metal structures or parts	Fixes metal structures or parts by bending, cutting, drilling, welding, hammering, grinding, soldering, and painting.
51 Construct metal or steel structures	Erects bridges, communication antennas, and other steel structures. May require the assistance of others and use of heavy equipment.
52 Install, maintain, and repair pipe assemblies	Installs, connects, and tests pipe assemblies and fixtures (e.g., plumbing, POL pipelines and pumps). Repairs pipe assemblies.
53 Construct wooden buildings and structures	Measures, saws, nails or planes to frame, sheathe, and roof buildings, or erects trestles, bridges, and piers from wood.
54 Construct masonry buildings and structures	Measures, lays brick or concrete blocks, or builds forms and pours concrete to construct walls, columns, field fortifications, and other concrete or masonry structures.
55 Produce technical drawings and illustrations	Uses drafting equipment or other media (e.g., pen, pencil, paint) to make technical drawings and blueprints. (Does not include maps, range cards, or other field expedient drawings.)
56 Prepare food and beverages	Prepares food and beverages according to recipes and meal plans (measure, mix, bake). Inspects fresh food and staples for freshness. Cleans equipment and work area.

	Major Duty	Definition
57	Prepare patients and equipment for medical procedures	Prepares patients for medical procedures by following prescribed rules and directions. Prepares medical or dental treatment areas for use by laying out instruments and equipment. Cleans equipment and area for future use.
58	Provide medical treatment	Provides medical treatment to Soldiers in the field or in medical or dental clinics, or administers veterinary treatment to animals (e.g., administers injections, takes blood pressure, changes sterile dressings). (Does not include performing basic first aid.)
59	Schedule patients and medical services	Schedules and provides routine information to persons seeking medical, dental, or counseling services.
60	Provide counseling and other interpersonal interventions	Counsels individuals and groups (e.g., families) on personal issues and relationship problems in a clinical, non-supervisory setting. (Does not include coaching and counseling Soldiers on performance-based issues.)
61	Perform laboratory procedures	Prepares and handles samples for laboratory tests (e.g., medical, chemical, biological). Conducts various types of laboratory tests following prescribed protocols and procedures. Files and reports results.
62	Collect and analyze weather and environmental data	Collects data and information on weather and environmental conditions. Analyzes their effects on tactical operations.
63	Conduct land surveys	Surveys terrain to determine elevations, azimuths, and distances of terrain features. Records information.
64	Deliver presentations	Makes formal presentations (e.g., briefings, radio and television broadcasts).
65	Reproduce printed materials	Reproduces printed materials using duplicating machines (e.g., electronic copiers, printing presses). Collates and binds materials using various types of bindery equipment.
66	Demonstrate military presence	Presents a positive and professional image of self and the Army even when off duty. Maintains proper military appearance. Sets the precedent for other Soldiers to follow.
67	Maintain physical fitness	Meets Army standards for weight, physical fitness, and strength. Maintains health (e.g., dental hygiene) and fitness to meet requirements, to handle the physical demands of the daily job, and to endure the stress of combat.
68	Manage own duties and responsibilities	Manages own responsibilities (e.g., work assignments, personal finances, family, and personal well being), and appears on duty prepared for work. Sets goals, makes plans, and critically evaluates own performance. Works effectively without direct supervision but seeks help when appropriate.
69	Demonstrate extra effort and personal initiative on the job	Demonstrates high effort in completing work. Takes independent action when necessary. Seeks out and willingly accepts responsibility and additional challenging assignments. Persists in carrying out difficult assignments and responsibilities.
70	Manage own professional development	Develops job-related skills, devoting time off-duty to study and practice important job-related skills. Takes on additional job duties and responsibilities to prepare for promotion and actively seeks out opportunities for self-improvement. Keeps up-to-date technically.

Major Duty	Definition
71 Demonstrate personal integrity	Maintains high ethical standards. Does not succumb to peer pressure to commit prohibited, harmful, or questionable acts. Voluntarily reports thefts, misconduct, and any other violations of military order and discipline. Understands and accepts the basic values of the Army and acts accordingly.
72 Exhibit self-control	Controls personal behavior. Does not engage in negative behaviors, such as alcohol and substance abuse at work. Meets financial obligations consistently, displays emotional maturity, and does not allow personal matters to interfere with professional duties and obligations.
73 Follow orders and rules	Understands and carries out orders relayed orally or in writing. Displays respect for authority. Adheres to regulations, policies, and procedures while completing assignments. Checks the behavior of others to ensure compliance.
74 Contribute to team tasks	Takes ownership for and completes assigned tasks for team according to committed timelines. Demonstrates effort toward team goals. Does not pass work off to others or take shortcuts that compromise quality.
75 Direct peers and individual team members	Helps to define goals and organize and prioritize tasks for peers and individual team members. Generates plans and strategies for task completion, identifies resources needed to meet team goals, and shares resources or guides individual team members to resources to help complete their tasks.
76 Support peers and individual team members	Provides social support and empathy, offers verbal encouragement and acts respectfully towards peers and team members, especially when tasks or situations are difficult or demanding. Facilitates cohesion and effective working relationships between team members by acting honestly, communicating openly and helping to manage or resolve conflicts. Does not embarrass team members in front of others, act impatiently, or blame others.
77 Train peers and individual team members	Shares information with peers and individual team members, provides task explanations and demonstrations, answers questions, and gives timely and constructive feedback. Does not withhold information about team-related tasks.
78 Help peers and individual team members	Fills in or covers for peers or individual team members who are overwhelmed or absent. Rearranges own schedule and demonstrates flexibility to help other peers or individual team members. Puts in extra time and effort to help peers and team members without being asked and without complaining. Does not engage in off-task activities when other team members could use help.
79 Monitor peer and individual team member performance	Observes and is knowledgeable about the performance of peers or other team members. Pays attention to what peers and individual team members are doing. Evaluates progress of self and others and recognizes when team members may need help.
80 Monitor team performance	Pays attention to the team's situation, including relevant conditions, procedures, policies, resources, systems, equipment, technology, and level of team accomplishment. Notices and identifies team-relevant problems and obstacles.
81 Contribute to team planning	Helps in identifying alternative solutions, strategies, or options for dealing with problems, obstacles, or decisions. Helps in evaluating alternative courses of action, and takes preventive measures to avoid future problems.

Major Duty	Definition
82 Contribute to team coordination	Contributes to and encourages discussion of work distribution, workload balance, potential workload problems, and the sequencing of team members activities. Coordinates own task activities with other team members. Does not make unnecessary requests or overload other team members.
83 Plan and organize operations/missions and team tasks	Plans major operations or team tasks prior to their actual execution in field or workplace. Translates goals and objectives into tasks and activities. Forecasts possible problems for the platoon/squad/team and develops strategies for addressing these problems. Organizes and prioritizes work.
84 Direct and motivate individual Soldiers	Provides guidance and direction to individual Soldiers. Motivates Soldiers by providing them with recognition, encouragement, constructive criticism, and other feedback as appropriate. Helps to set goals and maintains performance standards for Soldiers. Monitors and counsels Soldiers on specific performance or personal problems, as needed.
85 Train and coach Soldiers	Trains, instructs, and coaches Soldiers on how to complete technical job tasks. Assists Soldiers in improving their technical job skills/proficiency.
86 Communicate information to Soldiers, peers, and superiors	Keeps Soldiers, superiors, and others informed about factors and issues affecting them. Obtains and then passes on information to those who should know.
87 Administer personnel actions and procedures	Completes performance appraisals. Makes or recommends various personnel actions. Keeps and maintains adequate records. Follows standard operating procedures.
88 Manage and monitor operations/missions and team tasks	Keeps an operation going once it has been initiated. Checks to make sure that Soldiers are carrying out their duties properly. Makes sure they have the right equipment. Monitors or evaluates the status of equipment readiness.
89 Direct and lead platoons/squads/teams	Directs and leads platoon/squad/team activities. Assigns NCOs and Soldiers duties and responsibilities for completing platoon/squad/team tasks. Coordinates the actions of squads/teams within unit and those of individual Soldiers.
90 Model correct behavior to Soldiers	Models the correct performance behavior to Soldiers, whether it be technical task performance under adverse conditions or exhibiting appropriate military bearing.
91 Support individual Soldiers	Demonstrates personal concern for Soldiers. Backs up and supports Soldiers as appropriate. Looks out for their welfare.
92 Build and manage platoon/squad/team cohesion	Builds and manages platoon/squad/team cohesion. Manages and resolves internal conflict among team members. Promotes and sustains team morale.
93 Engage and negotiate with host nationals and local leaders.	Interacts and meets with host nationals and local leaders (e.g., tribal, police chiefs) to obtain information, handle complaints, settle disputes, and resolve grievances between and among host nationals. Negotiates with host nationals to resolve conflicts with U.S. forces and to secure their support for U.S. military operations.
94 Coordinate with other units and non-Army personnel	Coordinates with other units and non-Army personnel (e.g., contractors, host nation forces) before, during, and after operations for support and equipment. Shares information on status, position, and actions with other units and non-Army personnel, as needed.

ID	GWA Title	Definition	Level Anchors		
			Low	Moderate	High
1	Getting Information	Observing, receiving, and otherwise obtaining information from all relevant sources.	Follow a standard blueprint	Review a budget	Study international tax laws
2	Identifying Objects, Actions, and Events	Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.	Test an automobile transmission	Judge the acceptability of food products	Determine the reaction of a virus to a new drug
3	Monitoring Processes, Materials, or Surroundings	Monitoring and reviewing information from materials, events, or the environment, to detect or assess problems.	Check to see if baking bread is done	Test electrical circuits	Check the status of a patient in critical medical care
4	Inspecting Equipment, Structures, or Materials	Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects.	Check that doors to building are locked	Inspect equipment in a chemical processing plant	Inspect a nuclear reactor
5	Estimating the Quantifiable Characteristics of Products, Events, or Information	Estimating sizes, distances, and quantities; or determining time, costs, resources, or materials needed to perform a work activity.	Estimate the size of household furnishings to be crated	Estimate the time required to evacuate a city in the event of a major disaster	Estimate the amount of natural resources that lie beneath the world's oceans
6	Judging the Qualities of Objects, Services, or People	Assessing the value, importance, or quality of things or people.	Determine whether to remove a tree that has been damaged	Determine the value of property lost in a fire	Establish the value of a recently discovered ancient art work
7	Evaluating Information to Determine Compliance with Standards	Using relevant information and individual judgment to determine whether events or processes comply with laws, regulations, or standards.	Review forms for completeness	Evaluate a complicated insurance claim for compliance with policy terms	Make a ruling in court on a complicated motion
8	Processing Information	Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.	Tabulate the costs of parcel deliveries	Calculate the adjustments for insurance claims	Compile data for a complex scientific report

ID	GWA Title	Definition	Level Anchors		
			Low	Moderate	High
9	Analyzing Data or Information	Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.	Determine the location of a lost order	Determine the interest cost to finance a new building	Analyze the cost of medical care services for all hospitals in the country
10	Making Decisions and Solving Problems	Analyzing information and evaluating results to choose the best solution and solve problems.	Determine the meal selection for a cafeteria	Select the location for a major department store	Make the final decision about a company's 5-year plan
11	Thinking Creatively	Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.	Change the spacing on a printed report	Adapt popular music for a high school brand	Create new computer software
12	Updating and Using Relevant Knowledge	Keeping up-to-date technically and applying new knowledge to your job.	Keep up with price changes in a small retail store	Keep current on changes in maintenance procedures for repairing sports cars	Learn information related to a complex and rapidly changing technology
13	Developing Objectives and Strategies	Establishing long-range objectives and specifying the strategies and actions to achieve them.	Plan the holiday schedule for an airline workforce	Develop the plan to complete the merger of two organizations over a 3-year period	Develop a 10-year business plan for an organization
14	Scheduling Work Activities	Scheduling events, programs, and activities, as well as the work of others.	Make appointments for patients using a predetermined schedule	Prepare the work schedule for salesclerks in a large retail store	Schedule a complex conference program with multiple, parallel sessions
15	Organizing, Planning, and Prioritizing Work	Developing specific goals and plans to prioritize, organize, and accomplish your work.	Organize a work schedule that is repetitive and easy to plan	Plan and organize your own activities that often change	Prioritize and plan multiple tasks several months ahead

ID	GWA Title	Definition	Level Anchors		
			Low	Moderate	High
16	Performing General Physical Activities	Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials.	Walk between work stations in a small office	Paint the outside of a house	Climb up and down poles to install electricity
17	Handling and Moving Objects	Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.	Change settings on copy machines	Arrange books in a library	Load boxes on an assembly line
18	Controlling Machines and Processes	Using either control mechanisms or direct physical activity to operate machines or processes (not including computers or vehicles).	Operate a cash register	Operate a drilling rig	Operate a precision milling machines
19	Working with Computers	Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.	Enter employee information into a computer database	Write software for keeping track of parts in inventory	Set up a new computer system for a large multinational company
20	Operating Vehicles, Mechanized Devices, or Equipment	Running, maneuvering, navigating, or driving vehicles or mechanized equipment, such as forklifts, passenger vehicles, aircraft, or water craft.	Drive a car	Drive an 18-wheel tractor-trailer	Hover a helicopter in strong wind
21	Drafting, Laying out, and Specifying Technical Devices, Parts, and Equipment	Providing documentation, detailed instructions, drawings, or specifications to tell others about how devices, parts, equipment, or structures are to be fabricated, constructed, assembled, modified, maintained, or used.	Specify the lighting for a work area	Specify the furnishings for a new school	Draw the electronic circuitry for a high-speed scientific computer

ID	GWA Title	Definition	Level Anchors		
			Low	Moderate	High
22	Repairing and Maintaining Mechanical Equipment	Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.	Make simple, external adjustments to a door hinge with ordinary hand tools	Adjust a grandfather clock	Overhaul a power plant turbine
23	Repairing and Maintaining Electronic Equipment	Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles.	Use knobs to adjust a television picture	Make repairs by removing and replacing circuit boards	Use complex test equipment to calibrate electronic equipment
24	Documenting/Recording Information	Entering, transcribing, recording, storing, or maintaining information in written or electronic/magnetic form.	Record the weights of trucks that use the highways	Document the results of a crime scene investigation	Maintain information about the use of orbiting satellites for private industry communications
25	Interpreting the Meaning of Information for Others	Translating or explaining what information means and how it can be used.	Interpret a blood pressure reading	Interpret how foreign tax laws apply to U.S. exports	Interpret a complex experiment in physics for general audiences
26	Communicating with Supervisors, Peers, or Subordinates	Providing information to supervisors, coworkers, and subordinates by telephone, in written form, e-mail, or in person.	Write brief notes to others	Report the results of a sales meeting to a supervisor	Create videotaped presentation of a company's internal policies
27	Communicating with People Outside the Organization	Communicating with people outside the organization, representing the organization to customers, the public, government, and other external sources. The information can be exchanged in person, in writing, or by telephone or e-mail.	Have little contact with people outside the organization	Make standard presentations about available services	Prepare or deliver press releases

ID	GWA Title	Definition	Level Anchors		
			Low	Moderate	High
28	Establishing and Maintaining Interpersonal Relationships	Developing constructive and cooperative working relationships with others and maintaining them over time.	Exchange greetings with a coworker	Maintain good working relationships with almost all coworkers and clients	Gain cooperation from a culturally diverse group of executives hostile to your company
29	Assisting and Caring for Others	Providing personal assistance, medical attention, emotional support, or other personal care to others such as coworkers, customers, or patients.	Help a coworker complete an assignment	Assist a standard traveler in finding lodging	Care for seriously injured persons in an emergency room
30	Selling or Influencing Others	Convincing others to buy merchandise/goods or to otherwise change their minds or actions.	Convince a coworker to assist you with an assignment	Deliver standard arguments or sales pitches to convince others to buy popular products	Deliver major sales campaign in a new market
31	Resolving Conflicts and Negotiating with Others	Handling complaints, settling disputes, and resolving grievances and conflicts, or otherwise negotiating with others.	Apologize to a customer who complains about waiting too long	Get two subordinates to agree about vacation schedules	Negotiate a major labor-management contract
32	Performing for or Working Directly with the Public	Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores, and receiving clients or guests.	Tend a highway toll booth	Sell shoes in a popular shoe store	Perform a monologue on national TV
33	Coordinating the Work and Activities of Others	Getting members of a group to work together to accomplish tasks.	Exchange information during a shift change	Organize the cleanup crew after a major sporting event	Act as general contractor building a large industrial complex
34	Developing and Building Teams	Encouraging and building mutual trust, respect, and cooperation among team members.	Encourage two coworkers to stick with a tough assignment	Lead an assembly team in an automobile plant	Lead a large team to design and build a new aircraft

ID	GWA Title	Definition	Level Anchors		
			Low	Moderate	High
35	Training and Teaching Others	Identifying the educational needs of others, developing formal educational or training programs or classes, and teaching or instructing others.	Give coworkers brief instructions on a simple procedural change	Teach a social sciences course to high school students	Develop and conduct training programs for a medical school
36	Guiding, Directing, and Motivating Subordinates	Providing guidance and direction to subordinates, including setting performance standards and monitoring performance.	Work occasionally as a backup supervisor	Supervise a small number of subordinates in a well-paid industry	Manage a severely downsized unit
37	Coaching and Developing Others	Identifying the developmental needs of others and coaching, mentoring, or otherwise helping others to improve their knowledge or skills.	Show a coworker how to operate a piece of equipment	Provide on-the-job training for clerical workers	Coach a college athletic team
38	Providing Consultation and Advice to Others	Providing guidance and expert advice to management or other groups on technical, systems-, or process-related topics.	Work in a position that requires little advising of others	Recommend a new software package to increase operational efficiency	Provide ideas for changing an organization to increase profitability
39	Performing Administrative Activities	Performing day-to-day administrative tasks such as maintaining information files and processing paperwork.	Complete routine paperwork on standard forms	Complete tax forms required of self-employed people	Serve as the benefits director for a large computer sales organization
40	Staffing Organizational Units	Recruiting, interviewing, selecting, hiring, and promoting employees in an organization.	Work in a position that has minimal staffing requirements	Interview candidates for a sales position and make hiring recommendations	Direct a large recruiting and employment program for a large international manufacturing organization
41	Monitoring and Controlling Resources	Monitoring and controlling resources and overseeing the spending of money.	Work as a housekeeper responsible for keeping track of linens	Work as a chef responsible for ordering food for the menu	Serve as a financial executive in charge of a large company's budget

APPENDIX D

Descriptive Statistics for MD-GWA Ratings

Manual, Physical, and Technical GWAs Exercise

		Generalized Work Activities									
		Inspecting Equipment, Structures, or Materials	Performing General Physical Activities	Handling and Moving Objects	Controlling Machines and Processes	Operating Vehicles, Mechanized Devices, or Equipment	Drafting, Laying out, and Specifying Technical Devices, Parts, and Equipment	Repairing and Maintaining Mechanical Equipment	Repairing and Maintaining Electronic Equipment		
ID	Major Duty	4	16	17	18	20	21	22	23	m	SD
6	<u>Troubleshoot and repair weapons</u>	1.90	.40	1.20	.60	.20	.20	1.90	.10	.81	.71
35	<u>Troubleshoot and repair mechanical equipment</u>	1.80	.60	1.00	.50	.40	.20	1.90	.00	.80	.67
34	Inspect and maintain mechanical equipment	1.90	.50	.90	.60	.50	.10	1.80	.00	.79	.67
4	Inspect and maintain weapons	2.00	.60	1.30	.50	.10	.10	1.60	.10	.79	.70
17	<u>Troubleshoot and repair electrical and power transmission systems</u>	1.60	.50	1.10	.70	.10	.20	.40	1.60	.78	.56
15	<u>Troubleshoot and repair electronic equipment</u>	1.50	.40	1.00	.60	.10	.30	.00	2.00	.74	.66
12	Fire indirect fire weapons	.30	1.30	1.70	1.40	.70	.00	.30	.00	.71	.63
2	Handle demolitions or mines	.70	1.00	1.70	.60	.20	.30	.60	.50	.70	.44
47	Operate hand-operated power excavating equipment	.10	1.40	1.30	1.80	.90	.00	.10	.00	.70	.69
16	<u>Install and maintain electrical and power transmission systems</u>	1.10	.60	1.20	.50	.10	.40	.30	1.30	.69	.42
14	<u>Install and maintain electronic equipment</u>	1.20	.50	1.00	.50	.00	.30	.00	1.90	.68	.61
51	Construct metal or steel structures	.20	1.30	1.30	1.30	.80	.40	.10	.00	.68	.53
20	<u>Troubleshoot and repair personal computers and computer networks</u>	1.40	.40	1.30	.10	.00	.20	.10	1.70	.65	.65
11	Fire heavy direct fire weapons	.30	1.20	1.50	1.30	.60	.00	.30	.00	.65	.56
48	Operate heavy equipment	.10	.70	1.20	1.50	1.60	.00	.10	.00	.65	.65
50	Repair metal structures or parts	.70	1.20	1.30	1.10	.20	.20	.20	.00	.61	.49
18	Install and maintain personal computers and peripheral equipment	1.20	.50	1.20	.10	.00	.20	.00	1.60	.60	.60
41	<u>Load and unload supplies</u>	.30	1.90	1.80	.10	.30	.10	.10	.00	.58	.74
49	Install, maintain, and repair plastic and fiberglass	.60	1.00	1.30	.80	.20	.20	.40	.00	.56	.42
53	Construct wooden buildings and structures	.30	1.40	1.50	.90	.20	.20	.00	.00	.56	.58
19	Install and maintain computer networks	.90	.40	1.20	.10	.00	.40	.00	1.50	.56	.54

Manual, Physical, and Technical GWAs Exercise

		Generalized Work Activities									
		Inspecting Equipment, Structures, or Materials	Performing General Physical Activities	Handling and Moving Objects	Controlling Machines and Processes	Operating Vehicles, Mechanized Devices, or Equipment	Drafting, Laying out, and Specifying Technical Devices, Parts, and Equipment	Repairing and Maintaining Mechanical Equipment	Repairing and Maintaining Electronic Equipment		
ID	Major Duty	4	16	17	18	20	21	22	23	m	SD
52	Install, maintain, and repair pipe assemblies	.90	1.00	1.30	.40	.20	.10	.50	.00	.55	.44
54	Construct masonry buildings and structures	.30	1.40	1.50	.80	.10	.20	.00	.00	.54	.58
36	Operate gas and electric powered equipment	.20	.30	.70	1.60	1.20	.00	.10	.10	.53	.55
1	Protect against NBC hazards	.70	.70	1.00	.80	.20	.00	.40	.30	.51	.32
5	Fire direct fire weapons	.10	.90	1.40	1.20	.20	.00	.20	.00	.50	.54
44	Inspect, store, and issue supplies	1.30	.70	1.20	.00	.20	.00	.00	.00	.43	.53
65	Reproduce printed materials	.10	.40	1.20	1.30	.10	.30	.00	.00	.43	.49
3	Engage in hand-to-hand combat	.10	1.70	1.00	.30	.20	.00	.00	.00	.41	.58
13	Drive track vehicles	.00	.20	.50	.30	2.00	.00	.10	.00	.39	.63
42	Drive wheeled vehicles	.10	.30	.40	.10	2.00	.00	.10	.00	.38	.63
43	Drive water craft	.10	.30	.40	.10	2.00	.00	.10	.00	.38	.63
57	Prepare patients and equipment for medical procedures	.40	.70	1.40	.10	.00	.30	.00	.00	.36	.46
7	<u>Navigate from point to point</u>	.00	.80	.80	.30	.60	.00	.00	.10	.33	.33
56	Prepare food and beverages	.50	.50	1.20	.30	.00	.00	.00	.00	.31	.40
58	<u>Provide medical treatment</u>	.10	.70	1.30	.30	.00	.10	.00	.00	.31	.43
61	Perform laboratory procedures	.20	.30	1.20	.50	.00	.30	.00	.00	.31	.38
9	Provide emergency first aid	.10	1.10	.90	.10	.00	.10	.00	.00	.29	.42
8	Maintain personal and operational security	.30	1.00	.60	.10	.00	.10	.00	.00	.26	.34
32	Control individuals and crowds	.10	1.60	.40	.00	.00	.00	.00	.00	.26	.52
67	Maintain physical fitness	.00	1.90	.10	.00	.00	.00	.00	.00	.25	.62
21	<u>Operate electronic equipment</u>	.10	.00	.40	.70	.00	.00	.10	.50	.23	.25
Mean Rating		.61	.82	1.09	.59	.39	.13	.28	.32		
SD of Means		.61	.47	.39	.49	.56	.13	.52	.62		

Working With and Directing Others GWA Factor Exercise

		Generalized Work Activities																		
ID	Major Duty	6 Judging the Qualities of Objects, Services, or People	13 Developing Objectives and Strategies	14 Scheduling Work Activities	27 Communicating with People Outside the Organization	28 Establishing and Maintaining Interpersonal Relationships	29 Assisting and Caring for Others	30 Selling or Influencing Others	31 Resolving Conflicts and Negotiating with Others	32 Performing for or Working Directly with the Public	33 Coordinating the Work and Activities of Others	34 Developing and Building Teams	35 Training and Teaching Others	36 Guiding, Directing, and Motivating Subordinates	37 Coaching and Developing Others	39 Performing Administrative Activities	40 Staffing Organizational Units	41 Monitoring and Controlling Resources	m	SD
75	<u>Direct peers and individual team members</u>	.50	1.75	1.25	.00	1.13	.38	.38	.38	.00	1.50	1.38	.50	1.75	.63	.13	.00	.50	.71	.60
84	<u>Direct and motivate individual Soldiers</u>	.75	.50	.25	.00	1.13	1.13	.38	.38	.00	.50	.38	.63	1.88	1.25	.00	.00	.25	.55	.51
88	Manage and monitor operations/missions and team tasks	.88	.50	1.00	.13	.38	.00	.25	.25	.00	1.50	.88	.13	1.25	.25	.25	.38	1.25	.54	.47
89	Direct and lead platoons/squads/teams	.50	.75	1.25	.00	.63	.00	.38	.25	.00	1.50	.88	.25	1.38	.38	.25	.13	.63	.54	.46
93	<u>Engage and negotiate with host nationals and local leaders.</u>	.63	.50	.00	1.63	1.50	.25	.88	2.00	.88	.13	.13	.00	.00	.00	.00	.00	.00	.50	.64
76	<u>Support peers and individual team members</u>	.25	.13	.00	.00	1.50	1.63	.25	1.00	.00	.38	1.88	.25	.38	.75	.00	.00	.00	.49	.61
82	<u>Contribute to team coordination</u>	.63	.63	1.50	.00	.88	.50	.13	.50	.00	1.75	1.25	.13	.13	.25	.00	.00	.00	.49	.54
60	Provide counseling and other interpersonal interventions	.63	.88	.00	.75	1.25	2.00	.38	1.00	.63	.00	.00	.00	.00	.38	.13	.00	.00	.47	.55
92	Build and manage platoon/squad/team cohesion	.38	.25	.00	.00	1.38	.75	.13	1.50	.00	.50	1.75	.13	.63	.50	.00	.00	.13	.47	.55
77	Train peers and individual team members	.38	.38	.13	.00	1.00	.50	.13	.25	.13	.38	.75	1.63	.75	1.38	.00	.00	.00	.46	.48

Working With and Directing Others GWA Factor Exercise

Generalized Work Activities																				
ID	Major Duty	6 Judging the Qualities of Objects, Services, or People	13 Developing Objectives and Strategies	14 Scheduling Work Activities	27 Communicating with People Outside the Organization	28 Establishing and Maintaining Interpersonal Relationships	29 Assisting and Caring for Others	30 Selling or Influencing Others	31 Resolving Conflicts and Negotiating with Others	32 Performing for or Working Directly with the Public	33 Coordinating the Work and Activities of Others	34 Developing and Building Teams	35 Training and Teaching Others	36 Guiding, Directing, and Motivating Subordinates	37 Coaching and Developing Others	39 Performing Administrative Activities	40 Staffing Organizational Units	41 Monitoring and Controlling Resources	m	SD
83	<u>Plan and organize</u> operations/missions and team tasks	.50	1.75	1.50	.13	.13	.00	.13	.38	.00	1.75	.25	.00	.25	.00	.00	.13	.63	.44	.60
81	Contribute to team planning	.63	1.75	.63	.13	.38	.25	.13	.63	.00	1.13	.88	.13	.25	.13	.00	.00	.13	.42	.46
29	Provide technical guidance and advice on the installation, maintenance, and use of equipment	.38	.13	.13	1.38	.50	.50	.13	.00	.75	.50	.00	1.50	.25	.63	.13	.00	.13	.41	.44
59	Schedule patients and medical services	.38	.13	1.63	1.00	.25	1.00	.00	.25	.63	.38	.00	.00	.00	.00	1.38	.00	.00	.41	.51
85	Train and coach Soldiers	.63	.38	.13	.00	.50	.38	.13	.13	.00	.00	.00	1.88	.75	1.63	.00	.00	.13	.39	.55
94	<u>Coordinate with other units</u> and non-Army personnel	.25	.25	.25	1.88	1.00	.00	.13	.38	.75	.88	.38	.00	.00	.00	.00	.13	.38	.39	.48
74	Contribute to team tasks	.38	.50	.38	.00	1.00	.38	.25	.38	.00	.75	1.75	.13	.25	.13	.00	.00	.00	.37	.44
91	Support individual Soldiers	.50	.00	.00	.00	1.50	1.88	.13	.25	.00	.00	.13	.00	.63	.88	.00	.00	.13	.35	.55
79	Monitor peer and individual team member performance	1.25	.13	.13	.00	.75	.50	.00	.00	.00	.38	.50	.13	.50	.25	.00	.00	.38	.29	.33
80	Monitor team performance	1.25	.25	.13	.00	.50	.25	.00	.00	.00	.38	.38	.38	.63	.13	.00	.00	.63	.29	.32
58	<u>Provide medical treatment</u>	.63	.13	.00	.38	.38	2.00	.00	.00	.50	.00	.00	.00	.00	.00	.38	.00	.13	.26	.48
32	Control individuals and crowds	.63	.00	.00	1.25	.25	.38	.25	.75	.75	.00	.00	.00	.00	.00	.00	.00	.00	.25	.37

Working With and Directing Others GWA Factor Exercise

Generalized Work Activities																				
ID	Major Duty	6 Judging the Qualities of Objects, Services, or People	13 Developing Objectives and Strategies	14 Scheduling Work Activities	27 Communicating with People Outside the Organization	28 Establishing and Maintaining Interpersonal Relationships	29 Assisting and Caring for Others	30 Selling or Influencing Others	31 Resolving Conflicts and Negotiating with Others	32 Performing for or Working Directly with the Public	33 Coordinating the Work and Activities of Others	34 Developing and Building Teams	35 Training and Teaching Others	36 Guiding, Directing, and Motivating Subordinates	37 Coaching and Developing Others	39 Performing Administrative Activities	40 Staffing Organizational Units	41 Monitoring and Controlling Resources	m	SD
33	Collect information from and on individuals and groups	.50	.13	.00	1.38	.63	.25	.25	.13	.75	.00	.00	.00	.00	.00	.25	.00	.00	.25	.36
78	Help peers and individual team members	.13	.00	.13	.00	1.25	.88	.00	.13	.00	.25	.75	.00	.13	.25	.00	.00	.00	.23	.36
64	Deliver presentations	.13	.00	.00	1.88	.13	.00	.63	.00	.88	.00	.00	.13	.00	.00	.00	.00	.00	.22	.48
57	Prepare patients and equipment for medical procedures	.38	.00	.00	.00	.25	1.63	.00	.00	.50	.00	.00	.00	.00	.00	.25	.00	.13	.18	.39
9	Provide emergency first aid	.25	.00	.00	.13	.25	2.00	.00	.00	.38	.00	.00	.00	.00	.00	.00	.00	.00	.18	.47
73	Follow orders and rules	.38	.00	.00	.00	.38	.14	.25	.13	.13	.13	.13	.13	.50	.38	.00	.00	.13	.16	.15
86	Communicate information to Soldiers, peers, and superiors	.25	.00	.00	.25	.50	.13	.00	.00	.00	.00	.25	.25	.13	.13	.00	.00	.00	.11	.14
Mean Rating		.51	.41	.36	.42	.73	.68	.19	.38	.26	.50	.50	.28	.43	.35	.11	.03	.19		
SD of Means		.27	.52	.54	.63	.44	.67	.20	.47	.33	.58	.59	.50	.52	.44	.26	.08	.29		

Working With Information (A) Exercise

Generalized Work Activities																	
ID	Major Duty	1 Getting Information	2 Identifying Objects, Actions, and Events	3 Monitoring Processes, Materials, or Surroundings	5 Estimating the Quantifiable Characteristics of Products, Events, or Information	6 Judging the Qualities of Objects, Services, or People	7 Evaluating Information to Determine Compliance with Standards	8 Processing Information	9 Analyzing Data or Information	10 Making Decisions and Solving Problems	11 Thinking Creatively	12 Updating and Using Relevant Knowledge	13 Developing Objectives and Strategies	14 Scheduling Work Activities	15 Organizing, Planning, and Prioritizing Work	19 Working with Computers	
83	<u>Plan and organize operations/missions and team tasks</u>	1.00	.88	.63	1.00	.88	.38	.75	.63	1.38	1.25	1.00	1.88	1.38	1.63	.25	
81	Contribute to team planning	1.13	.88	.75	.63	.63	.38	.50	1.00	1.25	1.38	.75	1.63	.75	1.25	.13	
29	Provide technical guidance and advice on the installation, maintenance, and use of equipment	.63	.50	.63	.63	1.00	.38	.25	.38	1.00	.38	1.25	.25	.50	.50	.50	
62	Collect and analyze weather and environmental data	1.75	1.25	1.13	.88	.25	.00	1.50	1.75	1.13	.38	.63	.38	.13	.25	.63	
40	Monitor and control financial resources	1.13	.50	.75	1.00	.38	.13	1.25	1.13	1.00	.00	.63	.13	.25	.63	.50	
31	Analyze intelligence data	1.00	1.13	.50	.25	.63	.50	1.25	1.75	1.25	.50	.63	.25	.00	.25	.38	
94	<u>Coordinate with other units and non-Army personnel</u>	1.25	.50	.63	.63	.13	.13	.75	.63	.88	.25	.63	.50	.38	.50	.13	
58	<u>Provide medical treatment</u>	.88	.88	.88	.38	.63	.50	.50	.63	1.25	.25	1.13	.50	.38	.50	.25	
45	Order supplies and equipment	1.00	.50	.88	1.50	.50	.00	.75	.50	.63	.00	.50	.13	.25	.50	.38	
33	Collect information from and on individuals and groups	1.88	.75	.63	.38	.63	.00	.88	.25	.25	.25	.75	.50	.25	.25	.13	
46	Manage and control traffic	1.25	.88	1.38	.38	.13	.38	.63	.50	1.13	.13	.50	.63	.50	.63	.25	
59	Schedule patients and medical services	1.13	.13	.00	.38	.13	.00	1.00	.13	.25	.00	.25	.25	1.75	.75	.75	
37	Prepare and process forms	1.00	.25	.25	.13	.00	1.25	1.63	.38	.25	.00	.50	.00	.00	.25	.88	

Generalized Work Activities

D-8

Working With Information (A) Exercise (Continued)

Generalized Work Activities																	
ID	Major Duty	1 Getting Information	2 Identifying Objects, Actions, and Events	3 Monitoring Processes, Materials, or Surroundings	5 Estimating the Quantifiable Characteristics of Products, Events, or Information	6 Judging the Qualities of Objects, Services, or People	7 Evaluating Information to Determine Compliance with Standards	8 Processing Information	9 Analyzing Data or Information	10 Making Decisions and Solving Problems	11 Thinking Creatively	12 Updating and Using Relevant Knowledge	13 Developing Objectives and Strategies	14 Scheduling Work Activities	15 Organizing, Planning, and Prioritizing Work	19 Working with Computers	
86	Communicate information to Soldiers, peers, and superiors	1.63	.38	.13	.13	.25	.25	.88	.88	.50	.13	.50	.13	.13	.13	.13	
39	Write documents and correspondence	.63	.13	.13	.00	.13	.25	.63	.38	.25	.13	.25	.13	.13	.25	1.13	
30	Translate foreign languages	.75	.38	.25	.00	.00	.00	.50	.63	.50	.13	.75	.00	.00	.50	.00	
38	Maintain records and files	1.13	.38	.38	.13	.00	.38	1.13	.13	.13	.00	.38	.00	.00	.25	.88	
64	Deliver presentations	.38	.13	.00	.00	.13	.13	.63	.25	.25	.50	.50	.13	.13	.13	.38	
9	Provide emergency first aid	.88	.75	.75	.00	.13	.25	.50	.38	.88	.00	.75	.00	.13	.38	.00	
Mean Rating		1.07	.59	.56	.44	.34	.28	.84	.64	.74	.30	.64	.39	.37	.50	.40	
SD of Means		.37	.33	.37	.41	.30	.29	.36	.46	.42	.39	.26	.50	.46	.37	.31	

Generalized Work Activities

D-10

Working With Information (B) Exercise

Generalized Work Activities																
ID	Major Duty	1 Getting Information	2 Identifying Objects, Actions, and Events	3 Monitoring Processes, Materials, or Surroundings	5 Estimating the Quantifiable Characteristics of Products, Events, or Information	6 Judging the Qualities of Objects, Services, or People	7 Evaluating Information to Determine Compliance with Standards	8 Processing Information	9 Analyzing Data or Information	10 Making Decisions and Solving Problems	11 Thinking Creatively	12 Updating and Using Relevant Knowledge	13 Developing Objectives and Strategies	14 Scheduling Work Activities	15 Organizing, Planning, and Prioritizing Work	19 Working with Computers
27	Provide data processing and programming support	1.67	.50	.75	.63	.25	.13	1.25	1.13	.75	.38	.50	.13	.13	.38	1.75
25	Collect and decode electronic signals	1.50	.88	.75	.25	.25	.50	1.50	1.50	.75	.25	.50	.13	.13	.25	.25
26	Analyze electronic signals	1.27	.88	1.25	.38	.63	.25	1.38	1.75	.75	.13	.50	.13	.13	.13	.38
20	Troubleshoot and repair personal computers and computer networks	1.13	.63	1.00	.63	.38	.63	.62	.88	1.25	.27	.88	.00	.13	.25	1.38
44	Inspect, store, and issue supplies	.63	.63	.75	.63	.88	.75	1.13	.50	.50	.00	.38	.13	.25	.38	.38
87	Administer personnel actions and procedures	.75	.25	.25	.00	1.75	.63	.63	.25	.75	.13	.38	.13	.13	.25	.25
10	Scout and identify targets	1.63	1.63	1.24	.84	.73	.50	.62	.63	.63	.38	.38	.13	.13	.25	.13
28	Produce maps, overlays, or range cards	1.21	.63	.25	.75	.38	.25	.88	.63	.50	.63	.50	.13	.13	.25	.38
19	Install and maintain computer networks	.75	.38	1.00	.38	.38	.50	.62	.50	.63	.17	.75	.13	.25	.25	1.50
61	Perform laboratory procedures	.50	.38	.50	.25	.38	.63	1.00	.88	.13	.13	.38	.13	.13	.25	.25
18	Install and maintain personal computers and peripheral equipment	.75	.38	1.00	.38	.39	.50	.60	.38	.63	.05	.75	.13	.25	.25	1.38
7	Navigate from point to point	1.25	1.05	.81	.83	.29	.27	.84	1.00	1.00	.27	.25	.13	.13	.25	.25
63	Conduct land surveys	1.38	.75	.50	1.25	.25	.25	.63	.25	.13	.25	.25	.13	.13	.25	.25

Working With Information (B) Exercise (Continued)

Generalized Work Activities											
ID	Major Duty	21 Drafting, Laying out, and Specifying Technical Devices, Parts, and Equipment	24 Documenting/Recording Information	25 Interpreting the Meaning of Information for Others	26 Communicating with Supervisors, Peers, or Subordinates	27 Communicating with People Outside the Organization	38 Providing Consultation and Advice to Others	39 Performing Administrative Activities	41 Monitoring and Controlling Resources	m	SD
27	Provide data processing and programming support	.25	1.38	.50	.38	.38	.50	.38	.25	.62	.47
25	Collect and decode electronic signals	.00	1.13	1.13	.25	.38	.25	.13	.00	.55	.48
26	Analyze electronic signals	.00	.38	1.00	.13	.13	.25	.13	.00	.52	.49
20	Troubleshoot and repair personal computers and computer networks	.38	.25	.13	.25	.13	.38	.13	.00	.51	.40
44	Inspect, store, and issue supplies	.00	.50	.13	.38	.25	.00	1.38	1.00	.50	.36
87	Administer personnel actions and procedures	.00	1.25	.38	1.00	.25	.63	1.13	.13	.49	.44
10	Scout and identify targets	.25	.25	.25	.25	.13	.13	.00	.00	.48	.46
28	Produce maps, overlays, or range cards	.63	.88	.50	.13	.25	.13	.13	.13	.44	.29
19	Install and maintain computer networks	.38	.25	.13	.38	.25	.38	.13	.13	.44	.32
61	Perform laboratory procedures	.13	1.50	.63	.38	.38	.25	1.00	.00	.44	.35
18	Install and maintain personal computers and peripheral equipment	.38	.25	.13	.38	.25	.38	.13	.25	.43	.30
7	Navigate from point to point	.13	.25	.38	.25	.13	.13	.00	.00	.43	.38
63	Conduct land surveys	.25	1.50	.38	.13	.25	.13	.13	.00	.41	.41

Working With Information (B) Exercise (Continued)

Generalized Work Activities																
ID	Major Duty	1 Getting Information	2 Identifying Objects, Actions, and Events	3 Monitoring Processes, Materials, or Surroundings	5 Estimating the Quantifiable Characteristics of Products, Events, or Information	6 Judging the Qualities of Objects, Services, or People	7 Evaluating Information to Determine Compliance with Standards	8 Processing Information	9 Analyzing Data or Information	10 Making Decisions and Solving Problems	11 Thinking Creatively	12 Updating and Using Relevant Knowledge	13 Developing Objectives and Strategies	14 Scheduling Work Activities	15 Organizing, Planning, and Prioritizing Work	19 Working with Computers
22	Operate personal computers and networks	.88	.25	.25	.00	.13	.13	1.38	.50	.25	.27	.25	.00	.13	.25	1.88
23	Record and document audiovisual information	1.50	.50	.13	.25	.13	.13	.63	.38	.25	.13	.38	.13	.13	.25	.38
24	Send and receive radio messages	1.25	.13	.25	.13	.13	.13	1.13	.50	.25	.13	.38	.13	.13	.13	.25
55	Produce technical drawings and illustrations	.38	.25	.13	.25	.25	.13	.38	.13	.38	.75	.38	.13	.13	.25	.50
12	Fire indirect fire weapons	.75	.88	.50	.91	.26	.35	.58	.50	.63	.03	.25	.13	.00	.00	.13
Mean Rating		1.06	.61	.63	.48	.43	.37	.88	.68	.56	.24	.44	.11	.14	.24	.65
SD of Means		.39	.35	.36	.33	.38	.21	.33	.42	.29	.19	.18	.04	.06	.08	.59

Working With Information (B) Exercise (Continued)

		Generalized Work Activities									
ID	Major Duty	21	24	25	26	27	38	39	41	m	SD
22	Operate personal computers and networks	.00	1.25	.25	.13	.13	.00	.75	.00	.39	.49
23	Record and document audiovisual information	.13	2.00	.13	.13	.13	.13	.13	.13	.35	.46
24	Send and receive radio messages	.00	.63	.13	1.25	.63	.13	.13	.00	.34	.37
55	Produce technical drawings and illustrations	1.50	1.00	.25	.13	.13	.13	.13	.13	.34	.33
12	Fire indirect fire weapons	.13	.13	.13	.25	.13	.00	.00	.13	.29	.28
Mean Rating		.25	.82	.36	.34	.24	.22	.33	.13	.44	.39
SD of Means		.35	.56	.29	.30	.13	.17	.41	.23	.08	

Note. Mean ratings greater than 1.249 are shaded.

APPENDIX E

Summary of Ratings of “Coverage” By GWAs of Army Major Duties (By Major Duty Number)

Summary of Ratings of "Coverage" By GWAs of Army Major Duties (By Duty ID #)

ID #	Major Duty	Number of GWAs with Average Ratings:				Avg. Ratings > .99	Judged Coverage
		<0.50	.50 to .99	1.00 to 1.50	>1.50		
1	Protect against NBC hazards	4	3	1	0	1	Low Partial
2	Handle demolitions or mines	2	4	1	1	2	Full
3	Engage in hand-to-hand combat	6	0	1	1	2	Full
4	Inspect and maintain weapons	3	2	1	2	3	Full
5	Fire direct fire weapons	5	1	2	0	2	Low Partial
6	Troubleshoot and repair weapons	4	1	1	2	3	Full
7	Navigate from point to point	21	6	4	0	4	High Partial
8	Maintain personal and operational security	6	1	1	0	1	Not
9	Provide emergency first aid	39	7	1	1	2	Full
10	Scout and identify targets	14	6	1	2	3	Full
11	Fire heavy direct fire weapons	4	1	2	1	3	Full
12	Fire indirect fire weapons	20	8	2	1	3	Full
13	Drive track vehicles	6	1	0	1	1	Full
14	Install and maintain electronic equipment	3	2	2	1	3	Full
15	Troubleshoot and repair electronic equipment	4	1	1	2	3	Full
16	Install and maintain electrical and power transmission systems	3	2	3	0	3	Low Partial
17	Troubleshoot and repair electrical and power transmission systems	3	2	1	2	3	Full
18	Install and maintain personal computers and peripheral equipment	20	6	4	1	5	Full
19	Install and maintain computer networks	21	6	2	2	4	Full
20	Troubleshoot and repair personal computers and computer networks	18	6	6	1	7	Full
21	Operate electronic equipment	6	2	0	0	0	Not
22	Operate personal computers and networks	17	3	2	1	3	Full
23	Record and document audiovisual information	19	2	0	2	2	Full
24	Send and receive radio messages	17	3	3	0	3	High Partial
25	Collect and decode electronic signals	13	5	2	3	5	Full
26	Analyze electronic signals	14	4	4	1	5	Full
27	Provide data processing and programming support	11	7	3	2	5	Full
28	Produce maps, overlays, or range cards	12	10	1	0	1	High Partial
29	Provide technical guidance and advice on the installation, maintenance, and use of equipment	17	13	5	5	10	Full
30	Translate foreign languages	13	8	1	1	2	Full

Summary of Ratings of "Coverage" By GWAs of Army Major Duties (By Duty ID #)

		Number of GWAs with Average					
		Ratings:				Avg.	
ID #	Major Duty	<0.50	.50 to .99	1.00 to 1.50	>1.50	Ratings > .99	Judged Coverage
31	Analyze intelligence data	8	9	5	1	6	Full
32	Control individuals and crowds	20	3	1	1	2	Full
33	Collect information from and on individuals and groups	25	10	3	2	5	Full
34	Inspect and maintain mechanical equipment	2	4	0	2	2	Full
35	Troubleshoot and repair mechanical equipment	3	2	1	2	3	Full
36	Operate gas and electric powered equipment	5	1	1	1	2	Full
37	Prepare and process forms	15	3	3	2	5	Full
38	Maintain records and files	18	1	2	2	4	Full
39	Write documents and correspondence	15	3	4	1	5	Full
40	Monitor and control financial resources	8	7	6	2	8	Full
41	Load and unload supplies	6	0	0	2	2	Full
42	Drive wheeled vehicles	7	0	0	1	1	Full
43	Drive water craft	7	0	0	1	1	Full
44	Inspect, store, and issue supplies	16	10	5	0	5	High Partial
45	Order supplies and equipment	8	9	5	1	6	Full
46	Manage and control traffic	10	10	3	0	3	High Partial
47	Operate hand-operated power excavating equipment	4	1	2	1	3	Full
48	Operate heavy equipment	4	1	1	2	3	Full
49	Install, maintain, and repair plastic and fiberglass	4	2	2	0	2	Low Partial
50	Repair metal structures or parts	4	1	3	0	3	Low Partial
51	Construct metal or steel structures	4	1	3	0	3	Low Partial
52	Install, maintain, and repair pipe assemblies	4	2	2	0	2	Low Partial
53	Construct wooden buildings and structures	5	1	1	1	2	Full
54	Construct masonry buildings and structures	5	1	1	1	2	Full
55	Produce technical drawings and illustrations	19	2	1	1	2	Full
56	Prepare food and beverages	5	2	1	0	1	Low Partial
57	Prepare patients and equipment for medical procedures	21	2	1	1	2	Full
58	Provide medical treatment	27	17	3	1	4	Full
59	Schedule patients and medical services		5	7	2	9	Full
60	Provide counseling and other interpersonal interventions	10	4	2	1	3	Full

Summary of Ratings of "Coverage" By GWAs of Army Major Duties (By Duty ID #)

ID #	Major Duty	Number of GWAs with Average Ratings:				Avg. Ratings > .99	Judged Coverage
		<0.50	.50 to .99	1.00 to 1.50	>1.50		
61	Perform laboratory procedures	21	6	3	1	4	Full
62	Collect and analyze weather and environmental data	9	6	5	3	8	Full
63	Conduct land surveys	17	3	2	1	3	Full
64	Deliver presentations	31	6	1	2	3	Full
65	Reproduce printed materials	6	0	2	0	2	Not
67	Maintain physical fitness	7	0	0	1	1	Full
73	Follow orders and rules	16	1	0	0	0	Not
74	Contribute to team tasks	13	2	1	1	2	Full
75	Direct peers and individual team members	7	4	3	3	6	Full
76	Support peers and individual team members	12	1	1	3	4	Full
77	Train peers and individual team members	11	3	2	1	3	Full
78	Help peers and individual team members	14	2	1	0	1	Low Partial
79	Monitor peer and individual team member performance	12	4	1	0	1	Low Partial
80	Monitor team performance	13	3	1	0	1	Low Partial
81	Contribute to team planning	17	13	7	3	10	Full
82	Contribute to team coordination	9	5	1	2	3	Full
83	Plan and organize operations/missions and team tasks	17	9	9	5	14	Full
84	Direct and motivate individual Soldiers	9	4	3	1	4	Full
85	Train and coach Soldiers	12	3	0	2	2	Full
86	Communicate information to Soldiers, peers, and superiors	32	5	1	2	3	Full
87	Administer personnel actions and procedures	14	5	3	1	4	Full
88	Manage and monitor operations/missions and team tasks	10	3	3	1	4	Full
89	Direct and lead platoons/squads/teams	9	5	2	1	3	Full
91	Support individual Soldiers	12	3	0	2	2	Full
92	Build and manage platoon/squad/team cohesion	10	4	1	2	3	Full
93	Engage and negotiate with host nationals and local leaders.	10	4	0	3	3	Full
94	Coordinate with other units and non-Army personnel	21	14	3	2	5	Full

Note. Rating scale was 0=little or no coverage; 1=partial coverage; 2=strong coverage.