ABSTRACT

Wilson, Jason A. Are Analysts' Occupational Ability Requirement Ratings Necessary?: A Look at Using Other Occupational Descriptors to Capture the Rating Policy of Analysts. (Under the direction of J.W. Cunningham.)

The Occupational Information Network (O*NET) contains descriptors for a number of content domains. Trained analysts have rated over 1,100 occupations on those descriptors. The present study focused on four of the O*NET descriptor domains: knowledge, skills, generalized work activities (GWAs), and abilities.

The ability domain was previously identified by a panel of experts as being more abstract and difficult to rate than other descriptor domains. This study addressed that issue by running regression analyses using factors derived from knowledge, skill, and GWA ratings to predict ratings on the ability descriptors. The predicted ability ratings were then factor analyzed and compared to factors derived from the actual ability ratings.

Although all of the resultant multiple correlations were statistically significant, they were not all of sufficient magnitude to justify replacing actual ability ratings with ability ratings estimated from the more concrete domain descriptors. It is likely that the R's for many of the abilities were attenuated by unreliability in their ratings. In general, the cognitive abilities proved to be more predictable than the motor and perceptual abilities. It would appear practical to estimate requirements for some but not all of the abilities with ratings on the other domain descriptors. Factors derived from the predicted ability ratings showed some similarity to those derived from the actual ability ratings, thus lending further support to the validity of the predicted ratings.

Are Analysts' Occupational Ability Requirement Ratings Necessary?

A Look at Using Other Occupational Descriptors to

Capture the Rating Policy of Analysts

by

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DEDICATION

This achievement would not have been possible without my wonderful and loving family. Without your patience and support, I may have never made it this far. Words cannot fully express my love for each of you or how much each of you has touched my life.

BIOGRAPHY

Jason Ashley Wilson was born on June 13, 1976 in Hickory, North Carolina to Ronald and Donna Wilson. He attended elementary and middle school in Newton, North Carolina and graduated from Newton-Conover High School in 1994. Later that year, Mr. Wilson began his academic career at Appalachian State University. He graduated with a Bachelor of Science degree in Psychology in the spring of 1998. Following a one year hiatus, Mr. Wilson enrolled in the graduate school at North Carolina State University, and in the summer of 2003, he successfully completed the requirements for the Master of Science degree in Industrial/Organizational Psychology. Mr. Wilson plans to continue his work in Industrial/Organizational Psychology and obtain his Ph.D. Mr. Wilson enjoys sports, traveling, photography, and spending time with friends and family.

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Introduction

The world of work today is in many ways similar to the world of work yesterday, but the two can also be viewed as different as night and day. Among the ways in which the workplace of today differs from the workplace of yesterday includes the pace at which business moves, the rate of evolution in business/industry, and the fact that we live in a global market. Just looking at these differences, one can appreciate how difficult the task becomes to develop a database that can classify any occupation according to human attributes and generalized work activities (GWA's). This is what the Occupational Information Network (O*NET) has managed to accomplish over the past decade.

The O*NET's philosophy is to focus on the individual activities that make up an occupation rather than focusing specifically on the occupation as a whole entity. However, the O*NET does not limit its focus to work activities; it also takes into account human attributes. To do this, nomothetic job descriptors (NJD's) are utilized for "describing, comparing, and grouping a broad spectrum of jobs" in terms of common dimensions (Cunningham, Powell, Wimpee, Wilson & Ballentine, 1996, p. 219). Currently, there are two types of basic descriptors: generic activity statements and human attribute-requirement statements. These NJD's are also associated with measurable human attributes such as knowledges, skills, and abilities.

Of the O*NET descriptors, knowledges and skills are more concrete and, likely, more easily rated than abilities. However, the abstractness of the ability descriptors does not necessarily have to impact the field of occupational analysis. As long as attribute-requirements have been established for the necessary job components, then ability

requirement estimates can be derived by using the job component approach (Cunningham et al., 1996).

The proposed study's objective is to explore the feasibility of using scores on job components formed by the more concrete knowledges, skills, and GWA's to capture the ability rating policy of analysts. The establishment of ability weights for the job components would allow for the estimation of a job's ability requirements without the necessity of direct ability ratings.

Literature Review

The world in which we work is evolving at a staggering rate. Therefore, it goes without saying that an occupational database that can grow and adapt to this ever-changing market is not a luxury. It is a necessity. Enter the Occupational Information Network, or the O*NET. What the O*NET sets out to accomplish is not entirely novel, but it is revolutionary.

The hallmark of any good database is to establish a solid foundational framework. For the O*NET, this meant establishing generic job descriptors which universally apply to occupations, jobs, and positions (Cunningham, 1996). More specifically, it meant distinguishing between nomothetic and idiographic job descriptors. According to Allport (as cited in Cunningham, 1996), an idiographic descriptor is one that "describes individuals in terms specific to their unique characteristics"; in contrast, a nomothetic descriptor describes individuals in "terms of more general constructs" (Cunningham, 1996, p.248). From this it logically follows that the range of a descriptor's applicability is determined by the generality of the descriptor.

In 1996, Cunningham, Powell, Wimpee, Wilson & Ballentine recognized the utility of nomothetic job descriptors (NJD's). In their study, they admitted that NJD's are advantageous in "describing, comparing, and grouping a broad spectrum of jobs" (p. 220). There are two basic types of nomothetic job descriptors. These include generic activity statements and human attribute-requirement statements. Among these statements, those free of technological content are identified as worker-oriented statements, and given the rate of evolution and innovation in the world of work, these worker-oriented descriptors appear to be more flexible and adaptable for classifying jobs, now and in the future, than using tasks alone as the basic structure (Cunningham, 1996).

One such method to obtain these descriptors has been practiced through the years for revisions of the *Dictionary of Occupational Titles* (DOT). This method involved the expertise of job analysts who would observe and/or interview a job incumbent. Based upon their observations, the analysts identified and described the characteristics (i.e., tasks, duties, work activities, abilities, and knowledges) of the job being observed (Dunnette, 1999). The purpose of the DOT was “to develop authentic information concerning industries and jobs and to discover the qualifications required for success in various occupations” (Dunnette, 1999, p.3). This was achieved through the analysts’ efforts, and as a result of their thoroughness, the DOT has been successful in fulfilling its designated roles. One of which is person-job matching. However, success can be fleeting, and the DOT is not impervious to the changing world around it.

Dunnette (1999) identified three problem areas with the *Dictionary of Occupational Titles.* The first problem is that the job tasks, as identified by analysts, have not only been inconsistently defined but vary in levels of generality. Due to the

occupation-specific nature of these task definitions, cross-occupational comparisons are virtually impossible. The second problem stems from the fact that the DOT does rely solely on task descriptions which is ultimately self-handicapping. The exclusion of other types of descriptive information such as knowledges, skills, abilities, interests, and work environment makes it difficult for one to get an accurate portrayal of a job, thus, limiting the potential benefits of person-job matching. Finally, the DOT is just too time-consuming and too expensive to maintain. Much of the information is already out-of-date, and with the swift changes sweeping through the world of work, the DOT, as is, cannot keep pace. Unfortunately, "the availability of the DOT may have delayed the development of new thinking about occupations" (Dunnette, 1999, p.3).

Over the years the trend has been to generate new ideas about classifying occupations. The result of these ideas is the Occupational Information Network (O*NET), the successor to the DOT. The O*NET was nurtured and developed to address the DOT's shortcomings listed above by a panel (i.e., Advisory Panel for the Dictionary of Occupational Titles, or APDOT) who addressed the issues surrounding the creation of a new classification system. The rationale behind a classification system is to place objects into the fewest number of categories possible based upon a series of constructs allowing the summarization of information (Fleishman & Quaintance, 1984). Developing a new taxonomy is a three-step process (Fleishman & Mumford, 1991, as cited in Dunnette, 1999). Identifying and defining the objects to be described is the first step. Establishing a set of descriptors that allows for direct comparisons of the objects outlined in step one is the second step. Finally, a set of rules must be developed that allows the grouping of objects based on the descriptor set outlined in step two. In addition to

following this process, the panel behind the O*NET took into consideration the end-users and what information they may wish to glean from the database.

The make up of this new framework allows an occupation to be described in terms of general cross-job descriptors. These descriptors convey information about the work being done and work conditions and consider “both attributes arising from experience, such as skills and expertise, and more basic attributes of the individual, such as abilities, interests, and personality characteristics (Dunnette, 1999, p.5). The O*NET model contains two basic types of descriptors: generic activity statements and human attribute-requirement statements. Both of which are inherent to nomothetic job analysis. Included in the descriptor set for generic activity statements are generalized work activities (GWA’s); whereas, knowledges, skills, and abilities are integrated into the descriptor set of human attribute-requirement statements (Cunningham, 1996).

Synthetic Validity, the Job Component Approach, and Policy-Capturing

As established earlier, nomothetic job descriptors (NJD's) are useful for a multitude of reasons. These include, but are not limited to, "describing, comparing, and grouping a broad spectrum of jobs," and are "potentially linkable to measurable human attributes through the 'job component' approach, under which attribute-requirement weights are derived for a universal set of job components" (Cunningham et al., 1996). There are two methods for obtaining these attribute-requirement weights for these components. The first method uses expert ratings, while the second method involves policy-capturing which will be explained in more detail later in this section.

The job component approach is made possible thanks to the concept of synthetic validity. In 1952, Lawshe proposed three types of predictive validity: situational validity,

generalized validity, and synthetic validity (Lawshe, 1952). The former two types of validity are fairly basic. Situational validity is specific to a particular situation; whereas, generalized validity can be applied to multiple populations but only after demonstrating its worth over numerous samples. The third, and final, type of predictive validity proposed by Lawshe, synthetic validity, is not quite so straight-forward. Synthesis is defined as "the combination of separate elements into a whole" (Balma, 1959). Lawshe states that the term synthetic validity is used "to denote the *inferring* of validity in a specific situation" (Lawshe, 1952, p.32). In addition to introducing the concept, Lawshe proposed a methodology for establishing synthetic validity. The first step identifies the need for an "objectified job description device" listing activities involved. In steps two and three, requirement standards should be developed for these activities from step one, and these requirements should then be summarized and grouped according to the job or occupation in question. The final step in the process compares the synthetically derived validities with validities obtained traditionally. If these results are sufficient, then the synthetically derived validities can be used for other jobs or job families. Given these steps it becomes obvious that the common denominators in synthetic validity are the characteristics or components of jobs (McCormick, 1959). There are four job characteristics which "lend" themselves to synthetic validity. These include the job's overall nature, the ratings of human traits, job-oriented elements and worker-oriented elements. The latter two will be addressed at length in the *Instruments & Data* section of this paper.

With its foundation anchored in the time and motion studies of the early 1900's, the job component approach requires that the basic components involved in the

successful performance of a job be identified. These components must then be validated for the job. If another job includes one or more of the already validated components, then these validities can be applied to this job with no further effort (Jeanneret, 1992). To isolate these components, job analyses must be conducted. Because of the emphasis on job components, McCormick, DeNisi, and Shaw (1979) later adopted the phrase "job component validity" to stress the application of the synthetic validity methodology to these job characteristics.

Before this, McCormick, Jeanneret, and Mecham (1972) applied synthetic validity to job characteristics and job dimensions based on the Position Analysis Questionnaire (PAQ) with the hope of predicting aptitudinal requirements. They theorized that the job dimensions derived from PAQ data would act as "common denominators for use in determining the degree of communality between and among jobs in terms of their work activities" (p.339). The sample used consisted of 90 jobs where incumbent test data could be obtained from both the PAQ and the GATB. To maximize the validity of synthetically derived job requirements, it would be optimal to test them over a specified period of time to determine whether or not the personnel selected using these requirements perform at a satisfactory level. However for McCormick et al.'s study (1972), this was not feasible. Instead, they used incumbent data as the basic criteria for comparison.

McCormick et al.'s study (1972) was conducted in two phases. The first phase involved using GATB mean test scores. The use of these test scores was based on the assumption that an individual with certain aptitudes tends to gravitate towards and hold a job which affords the individual the opportunity to use these aptitudes. The second phase of their study used the GATB validity coefficients because these coefficients sufficiently

captured the importance of an attribute to a specified job. These coefficients characterized the connection between GATB scores and job performance. The results of a regression analysis demonstrated that aptitude test scores act as better predictors of job dimensions than validity coefficients. This finding suggests that using a structured job-analysis tool like the PAQ can facilitate the synthetic derivation of aptitude requirements. Therefore, in certain situations it is possible to eliminate the need for the customary test validation since McCormick et al. (1972) discovered a direct connection between job-related data and aptitude requirements for jobs. In a follow-up study, McCormick, DeNisi, and Shaw (1979) aimed to strengthen the findings of McCormick et al. (1972) by applying the regression equations discovered in that study to a new sample of 102 jobs. The correlations of these predicted scores with actual job incumbent scores were significant and proved, once again, that the ability requirements of jobs can be estimated via the job component approach. The Worker Activity Profile and the OAI have also benefited from the job component approach (Cunningham, 1996). All of these are examples of policy capturing.

As mentioned above, policy capturing is one of two methods employed to attain attribute-requirement ratings. This approach involves "regression analysis in which jobs' component scores serve as predictor (x) variables and some external measure of the jobs' requirements for a particular attribute serves as the criterion (y) variable" (Cunningham et al., 1996). Put another way, the policy of a rater can be captured to a degree where the actions of that rater can be predicted if given the characteristics of the stimuli being assessed. A multiple linear regression model (i.e., policy equation) is used to identify and assign weights to variables considered by a rater, so that the rater's actions can be

reproduced by simply employing the policy equation. For example, Christal (1968a) playfully described the process of a king selecting his harem to illustrate how the policy equation functions. After rating the first 300 women, the king asked his "Most High First Counselor" to fill his harem from the remaining women waiting to be rated. The cost of failing to please the king was death. Luckily, the "Court Recorder" kept track of the characteristics of the women the king had already selected. From this data, the king's staff established weights for each characteristic based on the first 150 women the king selected. They then used these weights to predict the king's ratings for the remaining 150 women. They obtained an R^2 of .94 meaning they had successfully captured the king's rating policy. Using the regression equation they uncovered, they rated and successfully selected the king's harem from the over 8000 women remaining. A rater's policy is defined as what the rater does to arrive at his/her response when presented with a set of stimuli. Given this information, it should be noted that there are two reasons why a rater's policy cannot be accurately captured (Christal, 1968b). The first reason assumes that the rater considered an interaction between predictors, but more than likely, low intra-rater reliability, the second reason for the inability to capture a rater's policy, is the culprit. In the absence of these two conditions, policy capturing can be validated by comparing the new ratings as predicted by the regression analysis of actual ratings with the actual ratings.

So far, only the rating policy of an individual has been mentioned, but policy capturing can be applied to a group of raters. In fact as early as 1968(a), Christal summarized studies at that time by saying that policy boards (or groups) have been "highly consistent in their judgments" (p.41), that policy equations resulting from

regression models "have been very accurate," and that these equations have held up on cross-application. In another study, Christal (1968b) says that job evaluation is a field to which policy capturing should be applied. He also stated that, due to the costs associated with field testing and the difficulty of obtaining measurements on certain factors, policy capturing is a viable alternative. It is for this reason that expert ratings are used to derive the ability weights of job components and why policy capturing should be more frequently employed to estimate the ratings of abilities (Cunningham et al., 1996). Remember that abilities, compared to knowledges and skills, are difficult to rate because abilities are abstract constructs (Cunningham et al., 1996; Harvey, 1991). None of the attributes (e.g., knowledges, skills, and abilities) can be measured through direct observation; however, one cannot deny that specific knowledges and skills can be observed, and subsequently, defined in terms of the behaviors involved in the successful completion of a job activity (Harvey, 1991). As long as attribute-requirements have been established for the necessary job components, these attributes can then be rated and ability requirement estimates can be derived using the policy capturing approach (Cunningham et al., 1996).

The current study was designed to use the policy capturing approach to estimate the ability requirements of job components based on a regression analysis using the O*NET knowledge, skill, and generalized work activity descriptors. The job-component scores of occupations were the predictors and the occupations' direct ability requirement ratings were the criteria in the policy capturing analyses. The purpose of this study was to determine whether or not ability requirement ratings from job incumbents and/or analysts are necessary. It also sought to determine whether or not regression-based ability

requirement estimates are more stable than direct ability ratings because, as mentioned above, ability definitions are abstract and difficult to rate. The O*NET system supplied the data for this study, and the O*NET variables are described below.

Instruments & Data

Description of the O*NET Variables

Knowledges

Fleishman, Costanza, Wetrogan, Uhlman, & Marshall-Mies (1995) define knowledge as "a collection of discrete but related and original facts, information, and principles about a certain domain" (p. 4-1). In addition, these facts, information, and principles, which are acquired through experiences, education, and training, must be arranged in such a way as to form some rational structure. More specifically, the O*NET is concerned with occupational knowledge and the development and maintenance of a knowledge taxonomy because the knowledges outlined in the taxonomy impacts "person/job matching, job training and retraining, career counseling, vocational interests, and [the] creation of job families or clusters" (p. 4-1). Creating this adaptive taxonomy is necessary in today's work setting to address employers' concerns about the knowledge base of potential employees. Occupational knowledges, or job-relevant knowledges, are knowledges that are required for successful performance on job tasks. Knowledges, as with other descriptors, vary in terms of specificity. Some knowledges can be occupation-specific; others may apply to a limited number of jobs, while the remaining knowledges can be considered general enough to apply to a greater variety of jobs (Fleishman et al., 1995). For the O*NET's purposes, the latter is ideal.

In order to establish a knowledge taxonomy, three steps must be carefully followed (Costanza, Fleishman, & Marshall-Mies, 1999). First, job-relevant definitions must be used to identify the knowledges. The second step requires the identification and quantification of knowledge areas that apply to a wide variety of jobs. Finally, the thoroughness, the reliability, and the validity of the taxonomy must be determined through the collection of data. It should be noted here that early steps to develop a knowledge taxonomy focused solely on "the structures and processes involved in developing and analyzing knowledge rather than on the knowledges themselves" (Costanza et al., 1999, p. 72). Based on these findings, the O*NET decided to employ an empirical approach to develop their knowledge taxonomy. The O*NET also decided to mine the Dictionary of Occupational Titles (DOT), the Fleishman Job Analysis Survey (F-JAS), and the Secretary's Commission on Achieving Necessary Skills (SCANS) for existing knowledges and knowledge categories. This resulted in seven general knowledge areas (e.g., artistic/creative, business/administrative, mechanical/skilled trades, outdoor work, professional, scientific, and service sector) and 86 knowledges which were later consolidated into 52 knowledges.

To be more thorough, the O*NET rated the knowledges by following Fleishman's procedures for developing the F-JAS. This required raters to answer two questions about individual job tasks in a specific knowledge area (Fleishman, 1975). The result was 49 knowledges (Costanza et al., 1999). Upon a revision of the rating scales, a final total of 10 knowledge clusters (e.g., business/management, manufacturing/production, engineering/technology, mathematics/science, health services, education/training, arts/humanities, law/public safety, communications, and transportation) and 33

knowledges were established. To further refine the knowledge taxonomy, knowledge specialty areas were identified. The goal was to have between 2 and 10 specialty areas for each knowledge. A total of 214 specialty areas, spanning the 33 knowledges, were identified. This knowledge requirements taxonomy developed for the O*NET is a useful tool for describing and understanding the various knowledges (i.e., cross-functional and occupation-specific) required for a broad range of occupations (Costanza et al., 1999).

Skills

When it comes to examining and identifying occupational requirements, not much attention has been given to skills. In the limited number of studies that acknowledged skills, skills were defined as "gains in performance with practice on a certain task" (Mumford, Peterson, & Childs, 1999, p. 49), but the purpose of these early studies was to determine the factors that facilitate the speedy attainment of skills required for successful performance. These studies did not give attention to the makeup of skilled performance. Skilled performance requires that an individual possess a series of "strategies, procedures, and processes for acquiring and working with relevant information" (p. 50). These underlying processes that an individual uses to attain and work with knowledge make up the skills that the person has. However, skills are not necessarily static, permanent traits of workers. Skills may be cultivated through repeated exposure (i.e., experience) and practice which leads to either successful or unsuccessful application of the skill or skills. Because the presence of a skill or skills is determined by the performance of an activity, skills can only be defined in terms of some performance dimension. For the O*NET, these dimensions lie within the occupations identified by the O*NET.

These occupational skills are subsumed within three broad categories: basic skills, cross-functional skills, and occupation-specific skills (Mumford & Peterson, 1995). Basic skills are developed over time and are often associated with a formal education, but this is not a requirement. Furthermore, developed basic skills are the cornerstone for the acquisition of new skills, and they enable people to attain new knowledge at an accelerated rate. Basic skills can be divided into content skills and process skills. The former includes the skills necessary for the exchange of knowledge and information (i.e., reading comprehension, active listening, writing, and speaking), while the latter group concerns itself with the acquisition and application of new knowledge (i.e., active learning, learning strategies, monitoring, and critical thinking) (Mumford et al., 1999).

Cross-functional skills aid performance across domains common to most jobs and are subsumed by five general performance domains. These domains consist of "solving problems, working with technology, working with people, working within an organizational system, and working with resources" (Mumford et al., 1999, p. 50), and the relevant skill-sets stemming from these domains are problem-solving skills, technical skills, social skills, system skills, and resource management skills, respectively. This framework is based on the socio-technical systems theory of Katz and Kahn (1978).

Skills frequently used to identify and solve difficult, unique problems are considered problem-solving skills. In order, these are problem identification, information gathering, information organization, synthesis/reorganization, idea generation, idea evaluation, implementation planning, and solution appraisal (Mumford & Peterson, 1995). Technical skills are necessary for virtually every job, but of all the skills, they have received the least amount of attention. However, Mumford & Peterson (1995) set

out to change that and created the first taxonomy of technical skills. Reviewing completed job analyses for jobs specifically dealing with tools and machines, they fashioned a low-order taxonomy of 12 technical skills (e.g., analyze operations, design, select, install, program, test, monitor operations, operate and control, inspect products, maintain equipment, troubleshoot, and repair).

Because all jobs require human interaction and, more and more, organizations are stressing teamwork, social skills are a vital part of any skill set, but surprisingly, few attempts have been made to consolidate these skills into a coherent structure. Some of those who have attempted have focused on general intelligence or, more specifically, social intelligence (Moss, Hunt, Omwake, & Woodward, 1955; Marlowe, 1986; Zaccaro, Gilbert, Thor, & Mumford, 1991; as cited in Mumford & Peterson, 1995) while others have taken a more practical approach concentrating on measuring performance of incumbents in jobs where social interaction is key. The union of these two approaches yielded six social skills. The first skill social perceptiveness requires individuals to be cognizant of the social environment surrounding them and adjust their interaction behaviors accordingly, and this behavior adjustment is the second social skill, response coordination. This adjustment can serve one of two purposes: 1) changing the behavior of others and 2) assisting others' behaviors by means of instruction or help-related events. These purposes encompass the remaining social skills: persuasion/negotiation and instructing/service orientation, respectively (Mumford & Peterson, 1995). As with basic skills, some feel that social skills can be developed through experiencing a variety of social settings (Ford & Tisek, 1983).

Organizations are complex socio-technical systems, and the survival of these systems depends on its members' abilities, or system skills, to understand the internal and external dependencies of the organization (Mumford & Peterson, 1995). Because of these interdependencies, Bass (1994, as cited in Mumford & Peterson, 1995) stated that members of an organization may not be aware of how even a subtle change made in one area of the organization can have drastic consequences in another area of the organization. These relationships are, of course, difficult to discern unless members of the organization view the system in terms of a panoramic image. This vantage point allows one to see the system in its entirety and recognize the interactions contained within. To do this involves using visioning and systems perception skills. The remaining system skills are rooted in these first two skills; they are identification of key causes, identification of downstream consequences, judgment and decision making, and systems evaluation (Mumford & Peterson, 1995).

The final domain of cross-functional skills is resource management skills. Knowing that all jobs require the conversion of raw materials (i.e., time, money, materials, and personnel) into some meaningful product or outcome, it becomes evident that the skills required for the management of these resources are necessary (Mumford & Peterson, 1995). The skills of managing personnel resources and managing material resources have an organizational focus and are similar to those recognized by Fleishman, Mumford, Zaccaro, Levin, Hein, and Korotkin (1991). The remaining two skills of managing time resources and managing financial resources are more inherently individualistic (Mumford & Peterson, 1995).

The third and final skills category is occupation-specific skills. These are skills tailored to the specific activities performed on a given job or within a job family. They can be representative of both, basic and cross-functional skills (Mumford & Peterson, 1995).

Abilities

The two O*NET variables mentioned above, knowledges and skills, are dynamic in nature in that individuals are constantly acquiring new knowledges and skills through training and experiences. Although abilities can also be developed and fashioned through repeated exposure and experience, they are considered relatively static in nature. They are enduring worker characteristics that shape how and what knowledges and skills an individual can acquire. In essence, abilities act as a precursor to the acquisition and development of knowledges and skills and are a determining factor in how well one performs on a given task (Fleishman, Wetrogan, Uhlman, & Marshall-Mies, 1995). Fleishman et al. (1995) adopted Boyatzis' definition of a competency to define an ability; thus, an ability is "an underlying characteristic which is causally related to effective or superior performance in a job" (Boyatzis, 1982, as cited in Fleishman et al., 1995, p.10-2).

Jobs have been described and compared in terms of ability requirements for almost 90 years (Fleishman, Costanza, & Marshall-Mies, 1999), and in that time several inventories have tried to identify and define these abilities, but none have been as meticulously developed and used more extensively than the Fleishman Job Analysis Survey (F-JAS) (Cunningham et al., 1996). The concerns surrounding an ability requirements taxonomy is the generality of the descriptors used to define abilities

(Fleishman et al., 1999). Terms such as “athletic ability” and “musical ability” are too broad because each possesses underlying abilities that make up the overall concept that are these abilities. On the other hand, phrases such as “lift barbells of a given weight” and “solve quadratic equations of a given complexity” (p. 176) are too specific, thus, limiting the applicability of the descriptors across a variety of jobs, a necessity for an ability requirements taxonomy. In fact, Fleishman and Quaintance (1984) outlined the criteria that must be met, not only for an ability requirements taxonomy but, for any taxonomy.

First, they suggested that the relationship between the characteristics of a job task and successful performance of that task should be captured by the constructs underlying the descriptors. Next, they recognized that such a system should exhibit internal and external validity by incorporating its own measurement system and being anchored in a programmatic research base. Finally, the usefulness of a system should be established through the organization of the diverse information contained within into a database, therefore, assisting in the area of predicting human performance. Furthermore, the database should be developed in a way that makes it simple to understand by psychologists and lay persons, alike (Fleishman et al., 1999). The F-JAS satisfies these conditions.

The predecessor to the F-JAS was the Manual for Ability Requirements Scales, or MARS. To successfully identify abilities, Fleishman employed a method of administering task inventories to individuals and having them identify and rate the relationships between tasks and abilities. Correlations were run on this data to identify groups of tasks requiring similar abilities. The aim of such research is to “identify the most comprehensive but parsimonious set of relatively independent ability categories that are

the most useful and meaningful for describing human performance on the widest range of tasks within an ability domain" (Fleishman et al., 1999, p. 177). Using the method above, Fleishman discovered 10 psychomotor and 9 physical abilities that accounted for the bulk of performance variance associated on numerous tasks. After a meticulous inspection of the 19 abilities identified and further research in the area, the total number of abilities increased to 52. These 52 abilities became the Abilities Requirements Taxonomy and were included in the MARS and, eventually, the F-JAS. Also, these abilities can be placed into one of four general categories (i.e., cognitive, psychomotor, physical, and sensory-perceptual) depending upon the nature of the task and the ability required to perform that task. These abilities are measured using behaviorally anchored rating scales (BARS) (Fleishman et al., 1999).

To include the F-JAS in the O*NET ability scales required some minor alterations to the F-JAS (Fleishman et al., 1995). These adjustments were geared towards making the O*NET a user-friendly instrument capable of large-scale administration. This meant some definitions had to be revised to accommodate varying reading levels and reduce the reading demand on raters. Also, some of the task anchors were revised to include tasks which were thought to be more familiar to raters notwithstanding their differing backgrounds. In some instances, task anchors were rewritten or replaced by anchors that were considered less offensive to the members of specific cultural groups. Despite these revisions, the overall integrity of the F-JAS was maintained and has shown much promise for the O*NET.

Generalized Work Activities

The phrase “generalized work activities” (GWAs) is an adaptation of Outerbridge’s (1981, as cited in Jeanneret & Borman, 1995) concept of “generalized work behaviors [GWBs]”. Outerbridge defined these GWBs as a definitive collection of descriptors that are similar enough to adequately describe work behaviors but not so similar that they can only be applied to the behaviors of a given occupation. The premise underlying GWBs was adopted by the APDOT who modified the definition to include any “general activity statement applicable across a range of jobs and occupations” (Cunningham, Drewes, & Powell, 1995, p.111) and renamed “generalized work behaviors” to “generalized work activities”.

For the O*NET to be comprehensive and successful, similarities and differences between jobs must be sufficiently captured, and this is facilitated by GWAs (Jeanneret, Borman, Kubisiak, & Hanson, 1999). Through the use of GWAs, cross-job comparisons can be made more easily. However, to be considered for a GWA, a construct must satisfy the necessary requirements. These criteria include “being broad in scope and having applicability to a wide range of occupations, being based on job-analytic research, and being characteristic of the underlying structure of work” (Jeanneret et al., 1999, p.106). Henceforth, a more complete definition of a GWA can be derived. This definition states that a GWA is the combination of comparable job activities that are necessary for the successful completion of (a) key job function(s).

According to Cunningham (1996), there appears to be three different GWA levels that vary in terms of specificity. Foundation work activities is the most general of these levels because FWAs, for the most part, do not contain any technological content and can

be applied to nearly any occupation. Examples of FWAs include using math, writing, reading, and working with hands. Intermediate work activities (IWAs) can almost be applied to as many occupations as FWAs; however, IWAs do include some technological content. Examples of IWAs are "use of drawing and related devices… [and] maintaining/ repairing/setting up machines…" (Cunningham, 1996, p. 249). The final level of GWAs is area work activities (AWAs). These possess a great deal of technological content and can only be applied to the particular area in which they were identified. These descriptions of the different GWA levels are, at best, oversimplified. Because both IWAs and AWAs include technological content, assigning a GWA to one or the other is not as black and white as it seems. There is a gray area which sometimes makes such an assignment difficult. In these instances, a judgment must be made.

Worker-oriented and job-oriented variables

In 1959, McCormick made a significant contribution to the field of job analysis when he made the distinction between job-oriented and worker-oriented elements existing within jobs. Before this, the focus of job analyses was on the individual tasks that make up a job (i.e., job-oriented), but this perspective does not lend itself to cross-job comparisons. However, the introduction of worker-oriented elements helped to alleviate this problem. McCormick (1959) stated that a job-oriented element pertains to what the worker gets done rather than what the worker does to achieve the desired outcome. Because some technological content is included in job-oriented descriptors, IWAs and AWAs (from the previous section) can be considered job-oriented. As for what the worker does to achieve the desired outcome, this is addressed by worker-oriented elements. The FWAs mentioned in the previous section are considered worker-oriented

(Cunningham, 1996). Examples of job-oriented and worker-oriented elements are “bakes bread” and “manually pours ingredients into a container,” respectively (McCormick, 1959, pp. 410-411).

McCormick, Jeanneret, and Mecham “have dealt with the specification of human behaviors (e.g., handling objects, personal contact with customers), as opposed to the more technological aspects of the jobs, for the purpose of establishing common denominators across jobs,” and in 1972, McCormick et al. “attempted to specify the human attributes that are relevant to the kinds of activities or behaviors occurring in various jobs” (Fleishman & Quaintance, 1984, p. 51). Despite these efforts and the demonstrated effectiveness of employing job-oriented and worker-oriented elements, the O*NET fails to completely explore the relationship between job-oriented elements and worker-oriented elements and any influence they may have on other job-related descriptors contained in the O*NET.

Data Set

The data for this study included knowledge, skill, ability, and generalized work activity factors derived by Clark (2002). She used an O*NET data sample comprised of knowledge, skill, ability, and generalized work activity ratings for occupational units (OUs). These OUs acted as common denominators allowing the over 12,000+ DOT 9-digit classification codes to be combined with Occupational Employment Statistics (OES) 5-digit categories according to chosen USES descriptor profiles. After identifying these new groupings, professional job analysts assessed and improved upon the groups. The result was 1,100 OUs (Nottingham & Golec, 1995 as cited in Wadden, 1998).

Those rating the 1,100 OUs on the O*NET variables were trained Industrial/ Organizational graduate students as well as employees of the Occupational Field Center. The O*NET variables were rated on a 7-point Level and 5-point Importance scale for each OU. An NR (not relevant) option was included for descriptors not pertinent to effective job performance (Wadden, 1998).

Analyses & Results

The analyses were conducted to determine whether ability requirement ratings could be predicted by factors derived from other, more concrete, variables. All predictor factors used in this study were derived by Clark (2002), and the ability factors used as dependent variables were derived by Wadden (1998). Ratings based on both the O*NET Level and Importance scales were included. The following analyses were performed.

A) Clark's knowledge, skill, and generalized work activity factors were used to predict the ability factors derived by Wadden (Regression Analysis A).

B) In another regression analysis (Regression Analysis B), Clark's worker-oriented (abstract) and job-oriented (concrete) descriptors were used to predict the ability factors.

C) The factors accounting for the most variance (i.e., that yielded the highest R^2 in regression analyses A and B) were used to predict ability ratings (Ys) for the 52 individual abilities (Regression Analysis C). Based on the resultant regression equations, 52 Ys (predicted ability ratings) were then generated for each of the individual OUs.

D) The predicted ability ratings (Y) were factor analyzed, and the resultant factor structure was compared to the structure derived by Wadden (1998) from direct ability requirement ratings.

Preparatory to the analyses mentioned above, the factors identified by Clark (2002) for each domain (i.e., knowledges, skills, GWAs) and for each dimension (i.e., abstract, concrete) on each of the two scales (i.e., Importance, Level) were replicated using Clark's data set. During this process, a discrepancy was noticed between the factors derived by Clark and the factors derived in this study in the GWA domain using the Importance scale. This inconsistency was attributed to Clark's use of principle components as priors in her factor rotation in that analysis; whereas, all other factor rotations in her study were conducted using squared multiple correlations for the prior communality estimates. To establish the number of factors to rotate for GWA-Importance, a principle components analysis was conducted. The resultant eigenvalues were closely examined, and the number of eigenvalues that were = 1.00 determined the number of factors rotated. This was completed in accordance with Kaiser's rule (Kaiser, 1974) for determining the number of factors to rotate. Following this procedure, several factor analyses using R2's as communality estimates (i.e., principle axes analyses) and normalized varimax solutions were run. Each analysis rotated a different number of factors, and one rotated the number of factors determined using Kaiser's rule. After looking at the various factor solutions, it was decided that rotating number of factors estimated by Kaiser's rule was the best solution. Table 1 shows the factor loadings for GWA-Importance that were found in this study. No other problems were encountered during the replication process, and all other factor structures and values were identical to

those determined by Clark. Appendices A and B summarize the replicated factor structures for the domains and dimensions, respectively, and the variables that loaded on each factor. Factor loadings are also provided.

Wadden's (1998) ability factor structures for Importance and Level scales were also replicated using Clark's (2002) data set. Tables 2 and 3 summarize the 10 factors derived for the Importance and Level scales, respectively, and the salient variables that loaded on the factors.

Regression Analysis A

A stepwise regression procedure was used to determine which of the GWA, knowledge, and skill factors derived by Clark (2002) contributed to the prediction of each of the 10 ability factors derived by Wadden (1998). Two sets of analyses were conducted: one for the set of factors that were based on the Importance scale and the other for the set of factors based on the Level scale. A p-value of .05 was established for both the inclusion of a variable in the model and for that variable to stay in the model.

Tables 4 and 5 show the results of the stepwise procedures for the Ability Importance factors and Ability Level factors, respectively. Each table includes Partial R-Squares for each variable included and/or removed from the model, Model R-Squares, Unstandardized Betas, Standard Error, and Standardized Betas.

Model R-Squares (R^2) for the 10 Ability Importance factors range from .1875 and .6836 for Equipment Control and Verbal Ability, respectively. Other Ability factors with substantial R^2's were .6713 (Creativity), .5906 (Reasoning & Problem-Solving), and .5292 (Numerical Ability). The range of R^2 for the 10 Ability Level factors was .1124 (Equipment Control) and .7971 (General Cognitive Ability).

Table 1 (1 of 2) (GWA Importance) Seven-Factor Solution: Factor Titles, Salient GWAs, and Percentages of Variance Explained

Factor Title and O*NET Importance GWAs	Factor Loading	% Variance
1. Analyzing and Problem-Solving (20)		20.24
08. Processing Information	.84	
09. Analyzing Data or Information	.79	
02. Identifying Objects, Actions, and Events	.77	
25. Documenting/Recording Information	.76	
01. Getting Information Needed to Do Job	.74	
12. Updating and Using Job-Relevant Knowledge	.66	
26. Interpreting the Meaning of Information for Others	.65	
07. Evaluating Information for Compliance to Standards	.64	
10. Making Decisions and Solving Problems	.63	
19. Interacting with Computers	.63	
40. Performing Administrative Activities	.60	
39. Providing Consultation and Advice to Others	.57	
06. Judging the Qualities of Objects, Services, or Persons	.52	
27. Communicating with Supervisors, Peers, or Subordinates	.51	
15. Organizing, Planning, and Prioritizing Work	.43	
13. Developing Objectives and Strategies	.43	
28. Communicating with Persons Outside the Organizations	.39*	
05. Estimating the Characteristics of Materials, Products, Events or Information	.33*	
16. Performing General Physical Activities	-.55	
17. Handling and Moving Objects	-.51	
2. Managing Others (16)		19.98
37. Guiding, Directing and Motivating Subordinates	.91	
35. Developing and Building Teams	.86	
34. Coordinating the Work and Activities of Others	.85	
41. Staffing Organizational Units	.78	
38. Coaching and Developing Others	.77	
14. Scheduling Work and Activities	.75	
36. Teaching Others	.61	
42. Monitoring and Controlling	.63	
13. Developing Objectives and Strategies	.62	
15. Organizing, Planning, and Prioritizing Work	.58	
27. Communicating with Supervisors, Peers, or Subordinates	.57	
32. Resolving Conflicts and Negotiating with Others	.56	
40. Performing Administrative Activities	.49	
29. Establishing and Maintaining Interpersonal Relationships	.49	
10. Making Decisions and Solving Problems	.43	
39. Providing Consultation and Advice to Others	.42	

Table 1 (2 of 2)

Factor Title and O*NET Importance GWAs	Factor Loading	% Variance
3. Interacting with Others (8)		11.38
33. Performing for or Working Directly with the Public	.83	
28. Communicating with Persons Outside the Organizations	.74	
29. Establishing and Maintaining Interpersonal Relationships	.72	
30. Assisting and Caring for Others	.68	
31. Selling or Influencing Others	.59	
32. Resolving Conflicts and Negotiating with Others	.53	
26. Interpreting the Meaning of Information for Others	.47	
36. Teaching Others	.37	
4. Repairing and Maintaining Equipment (7)		7.88
04. Inspecting Equipment, Structures, or Materials	.76	
23. Repairing and Maintaining Mechanical Equipment	.70	
18. Controlling Machines and Processes	.60	
24. Repairing and Maintaining Electronic Equipment	.54	
03. Monitoring Processes, Materials, or Surroundings	.58	
17. Handling and Moving Objects	.50	
16. Performing General Physical Activities	.49	
5. Drafting and Designing (5)		7.12
22. Implementing Ideas, Programs, Systems or Products	.66	
21. Drafting, Laying-out, Specifying Technical Devices, Parts, and Equipment	.65	
11. Thinking Creatively	.64	
15. Organizing, Planning, and Prioritizing Work	.42	
05. Estimating the Characteristics of Materials, Products, Events	.41	
6. Teaching/Coaching (2)		2.29
36. Teaching Others	.45	
38. Coaching and Developing Others	.36	
7. Using Computers (2)		1.98
10. Making Decisions and Problem-Solving	.30	
19. Interacting with Computers	.36	

Table 2 (1 of 3) (Ability Importance) Ten-Factor Solution: Factor Titles, Salient Abilities, and Percentages of Variance Explained

O*NET Importance: Factor Title and Abilities	Factor Loading	% Variance
1. General Physical Ability (22)		19.21
34. Dynamic Strength	.86	
36. Stamina	.85	
33. Explosive Strength	.84	
32. Static Strength	.83	
38. Dynamic Flexibility	.82	
39. Gross Body Coordination	.82	
37. Extent Flexibility	.79	
35. Trunk Strength	.79	
40. Gross Body Equilibrium	.78	
31. Speed of Limb Movement	.77	
26. Multilimb Coordination	.72	
23. Manual Dexterity	.56	
18. Spatial Orientation	.49	
46. Depth Perception	.48	
45. Peripheral Vision	.44	
22. Arm-Hand Steadiness	.40	
29. Reaction Time	.39	
28. Rate Control	.38	
04. Written Expression	-.37	
27. Response Orientation	.33	
25. Control Precision	.33	
02. Written Comprehension	-.32	
2. Verbal Ability (19)		12.67
01. Oral Comprehension	.85	
51. Speech Recognition (Speech Hearing)	.84	
03. Oral Expression	.84	
52. Speech Clarity	.82	
04. Written Expression	.59	
14. Memorization	.57	
49. Auditory Attention	.56	
02. Written Comprehension	.56	
21. Time Sharing	.52	
05. Fluency of Ideas	.51	
20. Selective Attention	.44	
06. Originality	.44	
15. Speed of Closure	.38	
09. Inductive Reasoning	.36	
13. Number Facility	.32	
08. Deductive Reasoning	.32	
23. Manual Dexterity	-.32	
25. Control Precision	-.31	
12. Mathematical Reasoning	.31	

Table 2 (2 of 3)

O*NET Importance: Factor Title and Abilities	Factor Loading	% Variance
3. Equipment-Related Far Visual Ability (13)		10.25
42. Far Vision	.79	
44. Night Vision	.77	
47. Glare Sensitivity	.77	
45. Peripheral Vision	.72	
46. Depth Perception	.68	
18. Spatial Orientation	.64	
28. Rate Control	.54	
27. Response Orientation	.54	
29. Reaction Time	.51	
40. Gross Body Equilibrium	.34	
50. Sound Localization	.34	
39. Gross Body Coordination	.34	
21. Time Sharing	.33	
4. Manual Ability (13)		9.08
24. Finger Dexterity	.83	
22. Arm-Hand Steadiness	.79	
23. Manual Dexterity	.67	
30. Wrist Finger Dexterity	.65	
19. Visualization	.58	
25. Control Precision	.57	
43. Visual Color Discrimination	.57	
41. Near Vision	.48	
10. Information Ordering	.42	
26. Multilimb Coordination	.39	
37. Extent Flexibility	.34	
31. Speed of Limb Movement	.30	
17. Perceptual Speed	.27	
5. Closure Ability (11)		6.65
17. Perceptual Speed	.70	
11. Category Flexibility	.65	
15. Speed of Closure	.59	
16. Flexibility of Closure	.58	
41. Near Vision	.57	
14. Memorization	.45	
10. Information Ordering	.44	
09. Inductive Reasoning	.38	
20. Selective Attention	.35	
21. Time Sharing	.32	
08. Deductive Reasoning	.30	

Table 2 (3 of 3)

O*NET Importance: Factor Title and Abilities	Factor Loading	% Variance
6. Auditory Ability (6)		4.52
50. Sound Localization	.75	
48. Hearing Sensitivity (General Hearing)	.75	
49. Auditory Attention	.62	
27. Response Orientation	.36	
29. Reaction Time	.35	
20. Selective Attention	.33	
7. Reasoning & Problem-Solving (7)		4.50
08. Deductive Reasoning	.68	
07. Problem Sensitivity	.62	
09. Inductive Reasoning	.61	
16. Flexibility of Closure	.44	
15. Speed of Closure	.40	
02. Written Comprehension	.33	
04. Written Expression	.30	
8. Numerical Ability (3)		3.69
13. Number Facility	.79	
12. Mathematical Reasoning	.78	
02. Written Comprehension	.35	
9. Creativity (3)		3.42
06. Originality	.73	
05. Fluency of Ideas	.67	
19. Visualization	.48	
10. Equipment Control (5)		2.19
29. Reaction Time	.44	
28. Rate Control	.43	
27. Response Orientation	.40	
21. Time Sharing	.39	
20. Selective Attention	.34	

Table 3 (1 of 3) (Ability Level) Ten-Factor Solution: Factor Titles, Salient Abilities, and Percentages of Variance Explained

O*NET LEVEL: Factor Title and Abilities	Factor Loading	% Variance
1. General Cognitive Ability (25)		24.87
08. Deductive Reasoning	.92	
09. Inductive Reasoning	.92	
02. Written Comprehension	.86	
04. Written Expression	.85	
15. Speed of Closure	.82	
01. Oral Communication	.81	
07. Problem Sensitivity	.81	
05. Fluency of Ideas	.79	
12. Mathematical Reasoning	.78	
03. Oral Expression	.78	
11. Category Flexibility	.78	
10. Information Ordering	.76	
13. Number Facility	.76	
06. Originality	.74	
14. Memorization	.73	
52. Speech Clarity	.66	
16. Flexibility of Closure	.66	
41. Near Vision	.60	
21. Time Sharing	.54	
51. Speech Recognition (Speech Hearing)	.52	
17. Perceptual Speed	.52	
20. Selective Attention	.51	
19. Visualization	.35	
42. Far Vision	.36	
49. Auditory Attention	.32	
2. General Physical Ability (21)		21.08
34. Dynamic Strength	.89	
36. Stamina	.87	
33. Explosive Strength	.87	
35. Trunk Strength	.85	
39. Gross Body Coordination	.84	
38. Dynamic Flexibility	.84	
32. Static Strength	.82	
40. Gross Body Equilibrium	.82	
37. Extent Flexibility	.80	
31. Speed of Limb Movement	.76	
26. Multilimb Coordination	.72	
23. Manual Dexterity	.54	
46. Depth Perception	.53	
45. Peripheral Vision	.52	
18. Spatial Orientation	.51	
29. Reaction Time	.44	

Table 3 (2 of 3)

O*NET LEVEL: Factor Title and Abilities	Factor Loading	% Variance
28. Rate Control	.44	
27. Response Orientation	.39	
22. Arm-Hand Steadiness	.36	
25. Control Precision	.33	
47. Glare Sensitivity	.33	
42. Far Vision	.32	
50. Sound Localization	.30	
04. Written Expression	-.32	
02. Written Comprehension	-.30	
3. Equipment-Related Far Visual Ability (15)		10.23
44. Night Vision	.77	
47. Glare Sensitivity	.75	
42. Far Vision	.74	
45. Peripheral Vision	.70	
46. Depth Perception	.64	
18. Spatial Orientation	.63	
28. Rate Control	.53	
27. Response Orientation	.52	
29. Reaction Time	.48	
50. Sound Localization	.43	
21. Time Sharing	.41	
49. Auditory Attention	.35	
20. Selective Attention	.34	
16. Flexibility of Closure	.34	
40. Gross Body Equilibrium	.33	
4. Manual Ability (14)		10.10
24. Finger Dexterity	.88	
22. Arm-Hand Steadiness	.82	
23. Manual Dexterity	.75	
25. Control Precision	.65	
30. Wrist Finger Dexterity	.62	
43. Visual Color Discrimination	.62	
19. Visualization	.52	
41. Near Vision	.42	
26. Multilimb Coordination	.41	
17. Perceptual Speed	.39	
31. Speed of Limb Movement	.34	
37. Extent of Flexibility	.33	
10. Information Ordering	.32	
29. Reaction Time	.31	
5. Auditory Ability (8)		6.17
48. Hearing Sensitivity	.77	
50. Sound Localization	.72	
49. Auditory Attention	.72	
20. Selective Attention	.43	
27. Response Orientation	.42	
29. Reaction Time	.37	
51. Speech Recognition (Speech Hearing)	.31	
21. Time Sharing	.31	

Table 3 (3 of 3)

O*NET LEVEL: Factor Title and Abilities	Factor Loading	% Variance
6. Oral Communication (4)		3.10
51. Speech Recognition (Speech Hearing)	.56	
52. Speech Clarity	.46	
03. Oral Expression	.38	
01. Oral Comprehension	.33	
7. Equipment Control (4)		2.87
29. Reaction Time	.41	
28. Rate Control	.39	
27. Response Orientation	.38	
21. Time Sharing	.38	
8. Creativity (3)		2.38
06. Originality	.51	
05. Fluency of Ideas	.45	
19. Visualization	.41	
9. Perceptual Speed (2)		2.10
17. Perceptual Speed	.38	
41. Near Vision	.32	
10. Numerical Ability (2)		1.63
13. Number Facility	.53	
12. Mathematical Reasoning	.51	

Table 4 (1 of 8) Stepwise Regression Analysis for Ability Importance: Partial R-Square, Model R-Square, Unstandardized Beta (*B*), Standard Error (*SE B*), and Standardized Beta (ß)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
1. General Physical Ability					
Information Processing and Communications	.2256	.2256	-.25521	.03726	-.23645
Repairing and Maintaining Equipment	.0835	.3091	.29623	.02782	.28409
Analyzing and Problem Solving	.0493	.3585	-.38851	.03704	-.38560
Equipment Operation and Monitoring	.0179	.3764	-.22051	.02871	-.20722
Fine Arts	.0095	.3860	-.14169	.03226	-.11645
Transportation and Safety	.0092	.3951	.15209	.02797	.13877
Accounting and Sales	.0087	.4038	-.15080	.03236	-.12777
Mathematics and Science	.0052	.4090	.11058	.03535	.10429
2. Verbal Ability					
Service	.4870	.4870	.41933	.03379	.41757
Management and Human Resources	.0760	.5630	.14354	.03138	.13434
Information Processing and Communications	.0398	.6028	.15647	.02658	.14725
Interacting with Others	.0227	.6255	.12361	.03114	.12260
Humanities and Social Sciences	.0125	.6380	.09862	.02151	.09168
Management	.0110	.6491	.17362	.02545	.16661
Health Services	.0091	.6582	.16770	.02643	.15997
Equipment Maintenance and Repair	.0086	.6667	-.11012	.01936	-.11148
Fine Arts	.0050	.6717	.15178	.02450	.12670
Technical Design	.0038	.6755	-.08691	.02232	-.08341

Table 4 (2 of 8)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Mathematics and Science	.0037	.6792	.10819	.02450	.10364
Thinking and Problem-Solving	.0029	.6821	.06933	.02504	.07041
Transportation and Safety	.0015	.6836	.02145	.02154	.04606
3. Equipment-Related Far Visual Ability					
Transportation and Safety	.3601	.3601	.57570	.02584	.54025
Equipment Operation and Monitoring	.0383	.3984	.21932	.02312	.21196
Fine Arts	.0167	.4151	.15192	.03189	.12841
Applied Physical Sciences and Technology	.0099	.4251	.21709	.02948	.20926
Mathematics and Science	.0135	.4386	-.28047	.03487	-.27205
Analyzing and Problem-Solving	.0113	.4491	.29867	.03795	.30487
Management and Human Resources	.0091	.4590	-.19994	.03343	-.18947
Equipment and Maintenance Repair	.0096	.4686	-.12693	.02746	-.13011
Information Processing and Communications	.0058	.4745	-.10599	.03402	-.10100
Management	.0033	.4778	.08836	.03062	.08586
Technical Design	.0027	.4805	.06847	.02872	.06654

Table 4 (3 of 8)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
4. Manual Ability					
Equipment Maintenance and Repair	.1688	.1688	.16353	.03925	.16673
Technical Design	.0521	.2210			
Management and Human Resources	.0443	.2653			
Drafting and Designing	.0297	.2950	.18210	.03568	.17354
Thinking and Problem-Solving	.0245	.3195			
Equipment Operation and Monitoring	.0280	.3475	.16221	.03235	.15593
Transportation and Safety	.0161	.3636	-.12676	.03002	-.11832
Technical Design (removed)	.0006	.3631			
Operating Equipment	.0103	.3734	-.19749	.03477	-.18675
Health Services	.0123	.3857	.30228	.03542	.29041
Interacting with Others	.0132	.3989	-.33082	.04005	-.33045
Fine Arts	.0129	.4118	.20640	.03660	.17353
Repairing and Maintaining Equipment	.0056	.4174	.37002	.04529	.36301
Managing Others	.0076	.4250	-.25644	.02444	-.26196
Management and Human Resources (removed)	.0018	.4232			
Accounting and Sales	.0084	.4317	.18405	.03987	.15952
Technical Design	.0025	.4342	.07205	.03532	.06964
Information Processing and Communications	.0029	.4371	.13537	.03765	.12830
Analyzing and Problem-Solving	.0043	.4414	-.20167	.03879	-.20475

Table 4 (4 of 8)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Thinking and Problem-Solving (removed)	.0007	.4406			
Applied Physical Sciences and Technology	.0040	.4446	-.11784	.03700	-.11636
Mathematics and Science	.0033	.4479	.09602	.03762	.09264
5. Closure Ability					
Analyzing and Problem-Solving	.2245	.2245	.45427	.04055	.48352
Service	.0295	.2539	-.27595	.02528	-.29013
Applied Physical Sciences and Technology	.0165	.2704	-.28346	.03238	-.29344
Repairing and Maintaining Equipment	.0266	.2970	.26663	.03189	.27423
Fine Arts	.0189	.3160	.16605	.03099	.14635
Humanities and Social Sciences	.0079	.3239	.12171	.02733	.11948
Mathematics and Science	.0100	.3339	.12924	.03649	.13072
Managing Others	.0081	.3420	.10630	.02487	.11384
Thinking and Problem-Solving	.0037	.3457	-.08081	.03219	-.08665
6. Auditory Ability					
Repairing and Maintaining Equipment	.0909	.0909	.20602	.04366	.21270
Service	.0449	.1358	.16560	.03108	.17478
Accounting and Sales	.0196	.1554	-.11407	.04023	-.10404
Biology	.0190	.1745	-.10678	.03107	-.10525
Analyzing and Problem-Solving	.0116	.1861	.17807	.04008	.19026

Table 4 (5 of 8)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Mathematics and Science	.0165	.2026	-.25538	.03906	-.25929
Information Processing and Communications	.0087	.2113	.15811	.04015	.15770
Management	.0059	.2172	-.11138	.02973	-.11328
Operating Equipment	.0062	.2234	-.12973	.03831	-.12910
Technical Design	.0067	.2301	.11660	.03331	.11861
Equipment Maintenance and Repair	.0066	.2367	.14888	.04110	.15975
Applied Physical Sciences and Technology	.0029	.2396	-.07977	.03898	-.08290
7. Reasoning & Problem-Solving					
Thinking and Problem-Solving	.2093	.2093	.13649	.02851	.14701
Repairing and Maintaining Equipment	.1562	.3655			
Mathematics and Science	.0552	.4207	.12092	.03183	.12285
Accounting and Sales	.0235	.4442	-.24224	.02863	-.22108
Equipment Operation and Monitoring	.0177	.4619	-.09304	.02357	-.09418
Biology	.0166	.4785	.19821	.02261	.19550
Technical Design	.0142	.4927	-.21658	.02779	-.22045
Applied Physical Sciences and Technology	.0210	.5137	.16564	.02656	.17224
Health Services	.0156	.5293	.11237	.02205	.11368
Information Processing and Communications	.0113	.5405	-.22054	.02897	-.22010
Analyzing and Problem-Solving	.0193	.5405	.32778	.03511	.35044

Table 4 (6 of 8)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Equipment Maintenance and Repair	.0117	.5716	.22719	.02456	.24393
Repairing and Maintaining Equipment *(removed)*	.0000	.5716			
Management and Human Resources	.0065	.5780	.11366	.02359	.11281
Operating Equipment	.0081	.5862	.15278	.02874	.15213
Drafting and Designing	.0044	.5906	.09939	.02883	.09974
8. Numerical Ability					
Accounting and Sales	.2134	.2134	.52630	.03239	.47238
Mathematics and Science	.1043	.3178	.19992	.03094	.19975
Fine Arts	.0744	.3921	-.29832	.03115	-.25974
Interacting with Others	.0584	.4506	-.10070	.04181	-.10417
Applied Physical Sciences and Technology	.0293	.4799	.15159	.03003	.15501
Management	.0193	.4991	.11105	.03087	.11115
Information Processing and Communications	.0127	.5118	.14800	.02988	.14526
Biology	.0049	.5167	-.08091	.02337	-.07848
Drafting and Designing	.0029	.5196	-.13198	.03179	-.13025
Health Services	.0020	.5216	-.05993	.03021	-.05962
Technical Design	.0021	.5237	.09307	.02899	.09317
Equipment Maintenance and Repair	.0018	.5255	.09142	.02939	.09653
Management and Human Resources	.0019	.5274	.07943	.03120	.07753
Service	.0018	.5292	-.08772	.04268	-.09111

Table 4 (7 of 8)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
9. Creativity					
Drafting and Designing	.4836	.4836	.36091	.02738	.35693
Fine Arts	.0652	.5488	.30114	.02434	.26274
Thinking and Problem-Solving	.0348	.5836	.16299	.01963	.17301
Equipment Operation and Monitoring	.0038	.6110	-.19217	.02138	-.19170
Managing Others	.0219	.6329	.13448	.01855	.14256
Information Processing and Communications	.0148	.6476			
Technical Design	.0068	.6545	.13318	.02157	.13359
Service	.0060	.6604	-.10669	.01788	-.11104
Humanities and Social Sciences	.0053	.6657	.09891	.01920	.09610
Accounting and Sales	.0019	.6675	.08085	.02304	.07272
Biology	.0023	.6698			
Applied Physical Sciences and Technology	.0015	.6713	.05742	.02000	.05884
Mathematics and Science	.0014	.6728	-.09544	.01947	-.09555
Biology (removed)	.0008	.6720			
Information Processing and Communications (removed)	.0007	.6713			
10. Equipment Control					
Equipment Operation and Monitoring	.1102	.1102	.35812	.02773	.38019
Humanities and Social Sciences	.0210	.1312	-.08778	.02811	-.09077
Management and Human Resources	.0096	.1407	.17241	.03014	.17946

Table 4 (8 of 8)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	?
Thinking and Problem-Solving	.0206	.1613	-.22009	.03142	-.24861
Drafting and Designing	.0087	.1701	.18610	.03412	.19586
Technical Design	.0122	.1823	-.14292	.03073	-.15257
Health Services	.0052	.1875	.07112	.02669	.07546

Table 5 (1 of 6) Stepwise Regression Analysis for Ability Level: Partial R-Square, Model R-Square, Unstandardized Beta (*B*), Standard Error (*SE B*), and Standardized Beta (ß)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
1. General Cognitive Ability					
Analyzing and Problem-Solving	.6262	.6262	.53385	.03527	.53243
Managing Others	.1090	.7352	.22442	.02411	.22204
Service	.0152	.7505	.22625	.02334	.21684
Drafting and Designing	.0168	.7673	.06352	.01764	.05791
Biology	.0069	.7742	.13133	.01685	.12120
Management	.0055	.7796	.14189	.02564	.13991
Applied Physical Sciences and Technology	.0043	.7839	.10286	.01720	.09985
Thinking and Problem-Solving	.0037	.7876	.16888	.03579	.16784
Teaching Others	.0048	.7924	-.11078	.01705	-.10108
Humanities and Social Sciences	.0040	.7964	.08074	.01688	.07575
Interacting with Others	.0008	.7971	-.05012	.02458	-.04810
2. General Physical Ability					
Repairing and Maintaining Equipment	.1711	.1711	.33072	.02836	.31836
Information Processing and Communications	.1450	.3161	-.24409	.03553	-.22469
Teaching Others	.0150	.3310	.13628	.02895	.12530
Analyzing and Problem-Solving	.0180	.3490	-.20920	.03764	-.21026
Drafting and Designing	.0149	.3640	.17406	.03511	.15991
Fine Arts	.0154	.3794	-.22223	.03646	-.18755
Transportation and Safety	.0106	.3900	.13406	.02982	.12331

Table 5 (2 of 6)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Technical Design	.0034	.3934	.11037	.03380	.10424
Management and Human Resources	.0024	.3958	-.12056	.04955	-.11644
Management	.0040	.3998	.15856	.04726	.15755
Managing Others	.0021	.4019	-.08680	.04391	-.08654
3. Equipment-Related Far Visual Ability					
Transportation and Safety	.3081	.3081	.57388	.02803	.54507
Technical Design	.0216	.3297	-.30574	.03215	-.29817
Drafting and Design	.0239	.3536	.17365	.03201	.16473
Teaching Others	.0159	.3784	.16011	.02559	.15201
Interacting with Others	.0089	.3784	-.12202	.02536	-.12185
Fine Arts	.0067	.0067	.11566	.03236	.10079
Information Processing and Communications	.0028	.3880	.05702	.02510	.05420
4. Manual Ability					
Equipment Maintenance and Repair	.1991	.1991	.20009	.04702	.20374
Management	.0575	.2567			
Fine Arts	.0418	.2984	.20858	.02985	.17855
Interacting with Others	.0401	.3385	-.44051	.03517	-.43212
Health Services	.0275	.3660	.32835	.03501	.31519
Biology	.0145	.3805	.22409	.02867	.21140
Teaching Others	.0208	.4013	-.23028	.03282	-.21476
Managing Others	.0059	.4072	-.24484	.02308	-.24761

Table 5 (3 of 6)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Transportation and Safety	.0053	.4126	-.16938	.02922	-.15804
Repairing and Maintaining Equipment	.0044	.4170	.20598	.04889	.20113
Analyzing and Problem Solving	.0024	.4194	-.20150	.03881	-.20542
Humanities and Social Sciences	.0038	.4232	.11107	.02308	-.24761
Information Processing and Communications	.0058	.4290	.14037	.03590	.13106
Management *(removed)*	.0009	.4281			
5. Auditory Ability					
Service	.0710	.0710	.20923	.02836	.21349
Equipment Maintenance and Repair	.0501	.1211	.32994	.03760	.34991
Technical Design	.0446	.1657	-.21950	.03181	-.21901
Biology	.0257	.1915	-.16712	.02738	-.16420
Applied Physical Sciences and Technology	.0070	.1985	-.13429	.04110	-.13878
Fine Arts	.0069	.2054	.10368	.03402	.09244
Managing Others	.0031	.2085	.05307	.02540	.05590
6. Oral Communication					
Service	.2659	.2659	.30099	.02949	.31251
Equipment Maintenance and Repair	.0930	.3590	-.26426	.03688	-.28518
Management	.0329	.3918			
Analyzing and Problem-Solving	.0194	.4113	-.37707	.05366	-.40739

Table 5 (4 of 6)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Information Processing and Communications	.0282	.4393	.39111	.03665	.38702
Applied Physical Sciences and Technology	.0074	.4468			
Biology	.0032	.4500	.11337	.02710	.11335
Management and Human Resources	.0032	.4532	.36635	.03910	.38036
Humanities and Social Sciences	.0074	.4606	.20670	.02823	.21010
Health Services	.0091	.4697	.19061	.02945	.19392
Management *(removed)*	.0003	.4694			
Applied Physical Sciences and Technology *(removed)*	.0011	.4682			
Thinking and Problem-Solving	.0046	.4728	-.16746	.05580	-.18030
Managing Others	.0047	.4775	-.10948	.03348	-.11734
Repairing and Maintaining Equipment	.0035	.4810	.11770	.03946	.12180
Fine Arts	.0022	.4832	.05718	.02647	.05188
7. Equipment Control					
Technical Design	.0377	.0377	-.14246	.03458	-.14986
Health Services	.0239	.0616	.14018	.02718	.14775
Humanities and Social Sciences	.0212	.0828	-.11765	.02848	-.12389
Equipment Maintenance and Repair	.0068	.0897	.17332	.03779	.19378
Applied Physical Sciences and Technology	.0100	.0997	-.17698	.04129	-.19282

Table 5 (5 of 6)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Fine Arts	.0045	.1042	-.11668	.03667	-.10967
Drafting and Designing	.0044	.1086	.09504	.03944	.09724
Managing Others	.0038	.1124	.05635	.02574	.06257
8. Creativity					
Drafting and Designing	.4012	.4012	.40753	.02801	.40563
Fine Arts	.0594	.4606	.23768	.02682	.21732
Management	.0418	.5024	.28288	.03022	.30451
Repairing and Maintaining Equipment	.0262	.5286	-.19924	.02903	-.20780
Teaching Others	.0180	.5466	.13195	.02172	.13144
Biology	.0205	.5671	-.12635	.02009	-.12731
Technical Design	.0095	.5767	.11578	.02543	.11847
Interacting with Others	.0056	.5823	-.04719	.02198	-.04944
Management and Human Resources	.0028	.5851	-.10423	.03352	-.10906
Applied Physical Sciences and Technology	.0016	.5867	.06613	.03160	.07008
9. Perceptual Speed					
Repairing and Maintaining Equipment	.1604	.1604	-.17146	.03281	-.18206
Health Services	.0410	.2013			
Applied Physical Sciences and Technology	.0404	.2417	-.30066	.03483	-.32442
Interacting with Others	.0291	.2709	-.24436	.02781	-.26067
Teaching Others	.0198	.2907	-.22574	.02590	-.22895

Table 5 (6 of 6)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Health Services (removed)	.0003	.2904			
Humanities and Social Sciences	.0109	.3013	.13190	.02750	.13756
Analyzing and Problem-Solving	.0047	.3061	-.05277	.02412	-.05850
Management	.0035	.3096	-.18285	.04117	-.20040
Managing Others	.0086	.3182	.14783	.03943	.16258
10. Numerical Ability					
Management and Human Resources	.0823	.0823	.54681	.04158	.57029
Interacting with Others	.0975	.1798	-.16250	.03268	-.16970
Teaching Others	.0414	.2213	-.08079	.03206	-.08021
Applied Physical Sciences and Technology	.0346	.2559	.27135	.02881	.28665
Management	.0193	.2752			
Thinking and Problem-Solving	.0221	.2973	-.13239	.05735	-.14318
Information Processing and Communications	.0256	.3229	.24496	.03525	.24349
Managing Others	.0115	.3344	-.24402	.03588	-.26272
Fine Arts	.0080	.3424	-.11345	.03509	-.10340
Analyzing and Problem-Solving	.0067	.3491	-.21572	.05734	-.23412
Drafting and Designing	.0026	.3517	-.15875	.03723	-.15749
Technical Design	.0047	.3565	.11982	.03106	.12220
Health Services	.0044	.3609	-.10462	.03349	-.10692
Management *(removed)*	.0014	.3595			

Regression Analysis B

For this set of regression analyses, Clark's factors for the Abstract and Concrete classifications, based on both the Importance and Level ratings, were used to predict the Ability factors derived by Wadden (1998). Thus, analyses were carried out for the following combinations: Importance-Abstract, Importance-Concrete, Importance-Abstract/Concrete, Level-Abstract, Level-Concrete, and Level-Abstract/Concrete. As in the previous set of analyses, a p-value of .05 was used to include a predictor in the model and to keep that predictor in the model.

The analyses for the Importance-Abstract factors produced R^2's ranging from .0757 for Equipment Control to .6074 for Verbal Ability. Creativity and Reasoning and Problem-Solving showed the second and third best predictability with R^2's of .5179 and .4893, respectively. The regression models using the Importance-Concrete factors proved to be more predictive than the models for the Importance-Abstract factors, as seven of the ten R^2's in the former models were higher than .40, with the highest being .6188 (Verbal Ability). The R^2 for Verbal Ability was followed by those for Equipment-Related Far Visual Ability and Creativity, which had R^2's of .5012 and .4752, respectively. The lowest R^2 was .1863 for Equipment Control. Tables 6 and 7 break down the regression models by identifying each variable included and/or removed from the model. Partial R-Squares, Model R-Squares, Unstandardized Betas, Standard Error, and Standardized Betas are included. Table 8 provides the same kind of information for the regression of the Ability-Importance factors on the Importance-Abstract and Importance-Concrete factors combined. The models for Verbal Ability (.6595), Creativity (.6167), and Reasoning & Problem-Solving (.5516) produced the highest R^2's, and those for

Table 6 (1 of 3) (Abstract) Stepwise Regression Analysis for Ability Importance: Partial R-Square, Model R-Square, Unstandardized Beta (*B*), Standard Error (*SE B*), and Standardized Beta (ß)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
1. General Physical Ability					
Analysis and Problem-Solving	.1358	.1358	-.36979	.02673	-.36319
Monitoring Processes	.0450	.1808	.22489	.02821	.20939
Visioning and Evaluation	.0219	.2027	-.14533	.02603	-.14653
Sales and Marketing	.0165	.2192	-.13188	.02691	-.12870
Management and Development	.0071	.2263	-.08234	.02626	-.08233
Thinking Creatively	.0065	.2328	-.08747	.02836	-.08101
2. Verbal Ability					
Service	.2934	.2934	.52631	.01884	.52486
Sales and Marketing	.1221	.4155	.33462	.01896	.33169
Management and Development	.0974	.5129	.31387	.01851	.31876
Visioning and Evaluation	.0313	.5442	.16991	.01834	.17400
Analysis and Problem-Solving	.0258	.5700	.16676	.01884	.16635
Monitoring Processes	.0237	.5937	-.16643	.01988	-.15739
Thinking Creatively	.0137	.6074	-.12476	.01999	-.11736
3. Equipment-Related Far Visual Ability					
Monitoring Processes	.0562	.0562	.24600	.03003	.23556
Thinking Creatively	.0096	.0658	-.10045	.03020	-.09568
Analysis and Problem-Solving	.0073	.0731	-.08611	.02848	-.08698
Visioning and Evaluation	.0043	.0774	.06347	.02772	.06582

Table 6 (2 of 3)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
4. Manual Ability					
Sales and Marketing	.0684	.0684	-.25089	.02778	-.25047
Management and Development	.0386	.1070	-.19310	.02712	-.19751
Service	.0197	.1267	-.13703	.02761	-.13763
Monitoring Processes	.0156	.1424	.13147	.02912	.12522
5. Closure Ability					
Analysis and Problem-Solving	.1930	.1930	.41673	.02493	.43893
Service	.0224	.2154	-.14081	.02495	-.14827
Management and Development	.0047	.2201	.06353	.02450	.06813
Sales and Marketing	.0048	.2249	-.06450	.02511	-.06751
Monitoring Processes	.0039	.2288	.06272	.02632	.06262
Visioning and Evaluation	.0030	.2318	.05078	.02428	.05491
6. Auditory Ability					
Monitoring Processes	.0341	.0341	.18627	.02899	.18670
Service	.0143	.0484	.11314	.02749	.11958
Visioning and Evaluation	.0048	.0531	-.06505	.02677	-.07061
Analysis and Problem-Solving	.0042	.0573	.06133	.02749	.06484
7. Reasoning & Problem-Solving					
Monitoring Processes	.1821	.1821	.41674	.02134	.41796
Visioning and Evaluation	.1549	.3370	.35404	.01970	.38453
Analysis and Problem-Solving	.1391	.4761	.35428	.02023	.37482

Table 6 (3 of 3)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Sales and Marketing	.0113	.4875	-.10231	.02036	-.10755
Service	.0018	.4893	.04049	.02024	.04282
8. Numerical Ability					
Service	.0700	.0700	-.25728	.02569	-.26760
Analysis and Problem-Solving	.0679	.1379	.25304	.02568	.26328
Thinking Creatively	.0243	.1623	-.16513	.02725	-.16201
Visioning and Evaluation	.0189	.1812	.12831	.02500	.13705
Management and Development	.0158	.1970	.12137	.02523	.12856
Monitoring Processes	.0082	.2052	-.09214	.02710	-.09088
9. Creativity					
Thinking Creatively	.3627	.3627	.61125	.02118	.60095
Visioning and Evaluation	.0799	.4426	.26325	.01943	.28177
Management and Development	.0355	.4781	.17922	.01961	.19023
Service	.0199	.4980	-.13951	.01997	-.14541
Sales and Marketing	.0161	.5141	.12084	.02010	.12519
Monitoring Processes	.0038	.5179	-.06251	.02107	-.06178
10. Equipment Control					
Monitoring Processes	.0349	.0349	.17412	.03158	.17052
Visioning and Evaluation	.0143	.0492	-.10324	.03175	-.12732
Management and Development	.0116	.0608	.09714	.02940	.12773
Thinking Creatively	.0080	.0688	-.08332	.02914	-.08899
Analysis and Problem-Solving	.0069	.0757	-.07474	.02993	-.08046

Table 7 (1 of 5) (Concrete) Stepwise Regression Analysis for Ability Importance: Partial R-Square, Model R-Square, Unstandardized Beta (*B*), Standard Error (*SE B*), and Standardized Beta (ß)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
1. General Physical Ability					
Information Processing and Communications	.2853	.2853	-.53576	.02332	-.53207
Equipment Management and Repair	.0704	.3557	.26222	.02314	.26238
Customer Service	.0160	.3717	.13790	.02537	.12593
Transportation and Safety	.0150	.3867	.13179	.02438	.12522
Management	.0097	.3964	-.10128	.02348	-.09990
Design and Drafting	.0044	.4008	.06875	.02383	.06683
Biology	.0023	.4032	.05055	.02423	.04831
2. Verbal Ability					
Management	.2140	.2140	.44380	.01851	.44464
Customer Service	.1622	.3762	.41927	.01999	.38891
Information Processing and Communications	.1169	.4930	.33579	.01837	.33871
Equipment/Processes Operations and Control	.0481	.5411	-.22150	.01919	-.21403
Equipment Management and Repair	.0320	.5731	-.17721	.01824	-.18010
Transportation and Safety	.0198	.5929	.14338	.01920	.13838
Economics and Accounting	.0103	.6031	-.10649	.01979	-.09974
Biology	.0094	.6125	.09933	.01909	.09640
Design and Drafting	.0063	.6188	-.08044	.01877	-.07942

Table 7 (2 of 5)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
3. Equipment-Related Far Visual Ability					
Transportation and Safety	.4629	.4629	.69873	.02165	.68279
Economics and Accounting	.0168	.4797	-.13419	.02231	-.12727
Customer Service	.0091	.4888	-.09812	.02254	-.09215
Equipment/Processes Operation and Control	.0060	.4947	.07766	.02163	.07598
Information Processing and Communications	.0048	.4996	-.06855	.02071	-.07002
Biology	.0019	.5015	.04474	.02152	.04397
4. Manual Ability					
Equipment Management and Repair	.1166	.1166	.32281	.02215	.33042
Equipment/Processes Operation and Control	.0923	.2090	.31579	.02331	.30731
Design and Drafting	.0770	.2860	.27951	.02280	.27793
Transportation and Safety	.0636	.3495	-.26246	.02333	-.25510
Customer Service	.0371	.3867	.20891	.02428	.19517
Management	.0280	.4147	-.16108	.02248	-.16254
Economics and Accounting	.0117	.4263	-.11371	.02403	-.10726
Information Processing and Communications	.0026	.4290	-.05061	.02231	-.05142
5. Closure Ability					
Information Processing and Communications	.1069	.1069	.30398	.02523	.32376
Customer Service	.0332	.1400	-.18068	.02746	-.17695
Economics and Accounting	.0219	.1619	.14927	.02719	.14762
Biology	.0130	.1749	.10962	.02622	.11233

Table 7 (3 of 5)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	
Equipment/Processes Operation and Control	.0111	.1860	.10470	.02636	.10682
Transportation and Safety	.0070	.1930	-.08288	.02637	-.08445
Management	.0033	.1963	.05411	.02543	.05724
6. Auditory Ability					
Equipment Management and Repair	.1142	.1142	.31787	.02494	.34240
Design and Drafting	.0303	.1445	-.16300	.02567	-.17057
Economics and Accounting	.0135	.1580	-.11844	.02704	-.11758
Transportation and Safety	.0132	.1711	.10892	.02626	.11141
Information Processing and Communications	.0114	.1826	.09932	.02511	.10618
Customer Service	.0095	.1921	.09607	.02734	.09445
Equipment/Processes Operation and Control	.0055	.1976	-.07272	.02624	-.07448
7. Reasoning & Problem-Solving					
Equipment Management and Repair	.1455	.1455	.35303	.02037	.38051
Biology	.1257	.2712	.33904	.02132	.34897
Customer Service	.0710	.3422	-.27385	.02233	-.26940
Information Processing and Communications	.0521	.3943	.20851	.02051	.22306
Management	.0268	.4211	.15123	.02067	.16069
Design and Drafting	.0212	.4423	.13969	.02096	.14627

Table 7 (4 of 5)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Equipment/Processes Operation and Control	.0144	.4567	-.11657	.02144	-.11946
Economics and Accounting	.0047	.4614	-.06839	.02210	-.06793
Transportation and Safety	.0039	.4653	.06124	.02144	.06268
8. Numerical Ability					
Economics and Accounting	.2457	.2457	.50023	.02339	.48869
Design and Drafting	.0835	.3292	.27685	.02218	.28510
Information Processing and Communications	.0473	.3765	.20624	.02171	.21698
Biology	.0167	.3932	-.12989	.02256	-.13148
Management	.0112	.4044	.10349	.02187	.10815
Equipment/Processes Operation and Control	.0067	.4111	.07720	.02268	.07780
Equipment Management and Repair	.0045	.4156	.06216	.02155	.06590
Customer Service	.0027	.4184	-.05561	.02363	-.05380
Transportation and Safety	.0025	.4208	.04928	.02269	.04960
9. Creativity					
Design and Drafting	.2656	.2656	.49369	.02107	.50944
Management	.0878	.3535	.28658	.02078	.30009
Equipment/Processes Operation and Control	.0512	.4046	-.22299	.02155	-.22520
Economics and Accounting	.0210	.4257	-.14844	.02222	-.14531
Equipment Management and Repair	.0189	.4446	-.12856	.02047	-.13656
Transportation and Safety	.0118	.4564	-.10488	.02156	-.10579

Table 7 (5 of 5)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Information Processing and Communications	.0088	.4652	-.08872	.02062	-.09353
Customer Service	.0077	.4729	-.09100	.02244	-.08922
Biology	.0023	.4752	-.04746	.02143	-.04814
10. Equipment Control					
Equipment/Processes Operation and Control	.1734	.1734	.38910	.02511	.41817
Design and Drafting	.0074	.1808	-.07879	.02457	-.08652
Management	.0055	.1863	.06680	.02422	.07444

Table 8 (1 of 5) (Abstract/Concrete) Stepwise Regression Analysis for Ability Importance: Partial R-Square, Model R-Square, Unstandardized Beta (*B*), Standard Error (*SE B*), and Standardized Beta (ß)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
1. General Physical Ability					
Information Processing and Communications	.2853	.2853	-.53604	.02328	-.53235
Equipment Management and Repair	.0704	.3557	.21385	.02448	.21398
Customer Service	.0160	.3717	.16952	.02669	.15481
Transportation and Safety	.0150	.3867	.13260	.02572	.12599
Sales and Marketing	.0121	.3987	-.11735	.02625	-.11453
Management and Development	.0048	.4035	-.06811	.02319	-.06810
Design and Drafting	.0030	.4065	.08068	.02547	.07843
Thinking Creatively	.0036	.4102	-.07423	.02833	-.06875
2. Verbal Ability					
Service	.2934	.2934	.28132	.02942	.28054
Management	.1722	.4655	.40663	.01923	.40740
Information Processing and Communications	.0672	.5328	.26041	.01874	.26267
Customer Service	.0549	.5877	.23935	.02601	.22202
Sales and Marketing	.0226	.6103	.11742	.02668	.11639
Monitoring Processes	.0181	.6284	-.12336	.02631	-.11666
Transportation and Safety	.0090	.6374	.07801	.02025	.07529
Equipment/Processes Operation and Control	.0053	.6427	-.11648	.02276	-.11255
Thinking Creatively	.0048	.6475	-.13017	.02241	-.12245
Equipment Management and Repair	.0051	.6527	.-.07769	.02396	-.07896

Table 8 (2 of 5)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Economics and Accounting	.0031	.6558	-.08177	.02196	-.07659
Biology	.0024	.6582	.05733	.02279	-.05564
Design and Drafting	.0014	.6595	.04541	.02134	.04483
3. Equipment-Related Far Visual Ability					
Transportation and Safety	.4629	.4629	.71040	.02301	.69420
Monitoring Processes	.0183	.4812	.17294	.02537	.16559
Economics and Accounting	.0141	.4953	-.13449	.02485	-.12755
Service	.0111	.5064	-.11924	.02222	-.12040
Equipment Management and Repair	.0066	.5130	-.09800	.02479	-.10085
Sales and Marketing	.0027	.5157	-.05882	.02294	-.05904
Thinking Creatively	.0019	.5176	.05033	.02384	.04793
4. Manual Ability					
Equipment Management and Repair	.1166	.1166	.26414	.02389	.27036
Equipment/Processes Operation and Control	.0923	.2090	.34133	.02653	.33217
Design and Drafting	.0770	.2860	.22911	.02547	.22782
Transportation and Safety	.0636	.3495	-.24410	.02365	-23726
Management and Development	.0421	.3917	-.21943	.02204	-.22443
Customer Service	.0414	.4331	.32378	.03429	.30247
Economics and Accounting	.0132	.4463	-.10961	.02605	-.10340
Information Processing and Communications	.0030	.4493	-.06589	.02327	-.06693
Visioning and Evaluation	.0047	.4540	.10562	.02788	.10893

Table 8 (3 of 5)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Sales and Marketing	.0028	.4568	-.08535	.02883	-.08521
Service	.0024	.4591	-.07078	.03192	-.07108
5. Closure Ability					
Analysis and Problem-Solving	.1930	.1930	.44517	.02493	.46888
Customer Service	.0282	.2213	-.08362	.03345	-.08190
Equipment/Processes Operation and Control	.0210	.2423	.13335	.02737	.13605
Design and Drafting	.0082	.2505	-.13752	.02756	-.14336
Service	.0068	.2573	-.10804	.03023	-.11376
Visioning and Evaluation	.0054	.2627	.08368	.02901	.09048
Transportation and Safety	.0033	.2660	-.05890	.02549	-.06001
Management and Development	.0029	.2689	.05074	.02426	.05441
6. Auditory Ability					
Equipment Management and Repair	.1142	.1142	.36919	.02601	.39769
Design and Drafting	.0303	.1445	-.17381	.02819	-.18189
Service	.0165	.2094			
Thinking Creatively	.0115	.1724	.14008	.03133	.13965
Transportation and Safety	.0192	.1916	.14227	.02756	.14552
Information Processing and Communications	.0101	.2017	.13421	.02576	.14348
Customer Service	.0082	.2099			
Service (removed)	.0005	.2094			
Economics and Accounting	.0062	.2197	-.12667	.02886	.10114
Sales and Marketing	.0041	.2197	.08877	.02921	.09327

Table 8 (4 of 5)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Visioning and Evaluation	.0048	.2245	-.11791	.02725	-.12798
Customer Service (removed)	.0016	.2229			
Equipment/Processes Operation and Control	.0035	.2263	-.06331	.02840	-.06483
7. Reasoning & Problem-Solving					
Monitoring Processes	.1821	.1821	.20704	.02692	.20764
Visioning and Evaluation	.1549	.3370	.25715	.02634	.27929
Analysis and Problem-Solving	.1391	.4761	.40149	.03141	.42477
Equipment Management and Repair	.0292	.5053	.26949	.02497	.29047
Biology	.0141	.5194	.10861	.02727	.11179
Economics and Accounting	.0096	.5289	-.11084	.02419	-.11010
Customer Service	.0097	.5387	-.19121	.03098	-.18810
Information Processing and Communications	.0042	.5429	-.10409	.03031	-.11136
Service	.0043	.5472	.10910	.02858	.11539
Sales and Marketing	.0026	.5498	.07492	.02521	.07876
Design and Drafting	.0018	.5516	.04903	.02328	.05134
8. Numerical Ability					
Economics and Accounting	.2457	.2457	.51440	.02438	.50252
Design and Drafting	.0835	.3292	.30771	.02322	.31688
Information Processing and Communications	.0473	.3765	.20429	.02124	.21492
Thinking Creatively	.0215	.3980	-.14752	.02486	-.14474
Management and Development	.0154	.4134			

Table 8 (5 of 5)

Variable	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Biology	.0130	.4263	-.15273	.02252	-.15460
Sales and Marketing	.0123	.4386	-.16583	.02424	-.17145
Management	.0102	.4488	.15617	.02246	.16320
Management and Development *(removed)*	.0003	.4485			
9. Creativity					
Thinking Creatively	.3627	.3627	.45178	.02211	.44416
Design and Drafting	.1208	.4735	.28957	.02256	.29881
Management	.0778	.5513	.24847	.01986	.26019
Equipment/Processes Operation and Control	.0273	.5785	-.18965	.02036	-.19153
Service	.0122	.5908	-.19000	.02452	-.19803
Economics and Accounting	.0092	.5999	-.09390	.02193	-.09192
Equipment Management and Repair	.0070	.6069	-.08482	.01823	-.09009
Analysis and Problem-Solving	.0038	.6107	-.05373	.01910	-.05602
Visioning and Evaluation	.0030	.6137	.09861	.02421	.10555
Customer Service	.0030	.6167	.07771	.02617	.07534
10. Equipment Control					
Equipment/Processes Operation and Control	.1734	.1734	.42810	.02737	.46009
Service	.0185	.1919	.12854	.02485	.14257
Monitoring Processes	.0100	.2019	.09423	.02585	.09911
Sales and Marketing	.0081	.2100	.08535	.02526	.09410

Equipment Control (.2100) and Auditory Ability (.2263) produced the lowest. Overall, the models that included the combination of Importance-Abstract and Importance-Concrete factors together produced higher R^2's than the models that used those two categories of predictors separately.

In three additional regression analyses, Level-Abstract and Level-Concrete factors were used separately to predict Ability-Level factors, while another analysis utilized both Level-Abstract and Level-Concrete as predictors of Ability-Level factors. The analyses using Level-Abstract factors as predictors yielded R^2 ranging from .0246 (Equipment Control) to .7591 (General Cognitive Ability). Oral Communication produced the second highest R^2 (.3836), while Equipment-Related Far Visual Ability and Auditory Ability had rather low model R^2 values of only .0294 and .0351, respectively. Results for the next set of analyses, using the Level-Concrete factors, produced an R^2 range comparable to that for the Level-Abstract factors. The R^2's in these analyses ranged from .0639 (Equipment Control) to .7648 (General Cognitive Ability). However, the remaining eight R^2 values fell within a much smaller range of .1998 (Auditory Ability) to .4357 (Equipment-Related Far Visual Ability). The combination of Level-Abstract and Level-Concrete factors did not do much to bolster the R^2's for the regression models. When the Level-Abstract and Level-Concrete factors were used in combination as predictors, General Cognitive Ability had the highest R^2 at .7844, while Equipment control showed the lowest R^2 at .1184. The values of five of the R^2's fell within .0433 of each other: General Physical Ability, .4264; Creativity, .4292; Manual Ability, .4317; Equipment-Related Far Visual Ability, .4636; and Oral Communication, .4697. Tables 9, 10, and 11 provide a breakdown of the stepwise regression results for the three analyses

Table 9 (1 of 3) (Abstract) Stepwise Regression Analysis for Ability Level: Partial R-Square, Model R-Square, Unstandardized Beta (*B*), Standard Error (*SE B*), and Standardized Beta (ß)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
1. General Cognitive Ability					
Analyzing and Problem-Solving	.5418	.5418	.73010	.01477	.72667
Management and Development	.0956	.6374	.30386	.01483	.30111
Visioning and Evaluation	.0682	.7056	.26335	.01496	.25880
Sales and Marketing	.0360	.7416	.19170	.01514	.18610
Service	.0175	.7591	.13656	.01517	13230
2. General Physical Ability					
Sales and Marketing	.0780	.0780	-.28069	.02845	-.27459
Analyzing and Problem-Solving	.0484	.1264	-.21756	.02774	-.21821
Service	.0047	.1311	-.06978	.02850	-06812
Visioning and Evaluation	.0045	.1357	-.06789	.02810	-.06723
3. Equipment-Related Far Visual Ability					
Visioning and Evaluation	.0192	.0192	.13800	.02883	.14110
Analyzing and Problem-Solving	.0058	.0251	-.07310	.02846	-.07571
Sales and Marketing	.0043	.0294	-.06492	.02917	-.06558
4. Manual Ability					
Sales and Marketing	.1569	.1569	-.39238	.02657	-.38935
Service	.0277	.1846	-.16519	.02662	-.16359
Management and Development	.0231	.2077	-.14898	.02602	-.15090
Visioning and Evaluation	.0108	.2185	-.10535	.02624	-.10582
Analyzing and Problem-Solving	.0069	.2253	.08142	.02591	.08284

Table 9 (2 of 3)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
5. Auditory Ability					
Service	.0229	.0229	.14725	.02847	.15188
Analyzing and Problem-Solving	.0121	.0351	-.10388	.02771	-.11008
6. Oral Communication					
Service	.2220	.2220	.44029	.02240	.46209
Sales and Marketing	.0730	.2950	.25729	.02236	.27057
Analyzing and Problem-Solving	.0648	.3599	-.23887	.02180	-.25755
Visioning and Evaluation	.0126	.3724	.10410	.02209	.11083
Management and Development	.0112	.3836	.09867	.02190	.10593
7. Equipment Control					
Service	.0186	.0186	.12741	.02716	.13853
Sales and Marketing	.0060	.0246	-.07127	.02711	-.07765
8. Creativity					
Visioning and Evaluation	.0770	.0770	.25823	.02621	.27705
Management and Development	.0286	.1056	.15662	.02599	.16945
Service	.0056	.1112	-.07200	.02659	-.07616
Analyzing and Problem-Solving	.0035	.1147	-.05516	.02588	-.05994
Sales and Marketing	.0034	.1181	.05515	.02654	.05845
9. Perceptual Speed					
Sales and Marketing	.0288	.0288	.16286	.02668	.17573
Service	.0244	.0512	-.13819	.02673	-.14882

Table 9 (3 of 3)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Analyzing and Problem-Solving	.0208	.0720	-.12912	.02602	-.14285
Visioning and Evaluation	.0033	.0753	-.05256	.02635	-.05741
10. Numerical Ability					
Service	.1152	.1152	-.32398	.02646	-.34156
Management and Development	.0093	.1245	.08861	.02587	.09556
Visioning and Evaluation	.0055	.1300	.06915	.02609	.07395

Table 10 (1 of 4) (Concrete) Stepwise Regression Analysis for Ability Level: Partial R-Square, Model R-Square, Unstandardized Beta (*B*), Standard Error (*SE B*), and Standardized Beta (ß)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
1. General Cognitive Ability					
Information Processing and Communications	.3221	.3221	.55298	.01481	.54330
Management	.2852	.6073	.53838	.01475	.53110
Biology	.0892	.6964	.30821	.01521	.29484
Design and Drafting	.0536	.7500	.23806	.01500	.23089
Equipment Maintenance and Repair	.0065	.7565	.08032	.01461	.07998
Production and Processing	.0036	.7602	-.07009	.01610	-.06340
Customer Service	.0034	.7635	-.06435	.01592	-.05891
Transportation and Safety	.0012	.7648	.03713	.01537	.03513
2. General Physical Ability					
Information Processing and Communications	.2579	.2579	-.51592	.02301	-.51080
Equipment Maintenance and Repair	.0702	.3281	.25813	.02270	.25903
Production and Processing	.0321	.3603	-.19617	.02499	-.17882
Design and Drafting	.0299	.3901	.17813	.02331	.17410
Transportation and Safety	.0208	.4109	.15153	.02388	.14450
Biology	.0080	.4189	.09382	.02363	.09044
Management	.0036	.4225	-.06005	.02292	-.05970
3. Equipment-Related Far Visual Ability					
Transportation and Safety	.4177	.4177	.65852	.02281	.64846
Customer Service	.0179	.4357	-.14056	.02358	-.13391

Table 10 (2 of 4)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
4. Manual Ability					
Equipment Maintenance and Repair	.1702	.1702	.40165	.02225	.40882
Management	.0739	.2441	-.27312	.02246	-.27540
Transportation and Safety	.0673	.3114	-.26777	.02341	-.25902
Design and Drafting	.0414	.3527	.20133	.02285	.19960
Production and Processing	.0378	.3905	.22045	.02453	.20382
Biology	.0233	.4138	.16084	.02317	.15728
Customer Service	.0153	.4290	.13249	.02425	.12399
5. Auditory Ability					
Equipment Maintenance and Repair	.0787	.0787	.27149	.02528	.28780
Design and Drafting	.0685	.1472	-.25104	.02596	-.25921
Production and Processing	.0203	.1675	-.14187	.02787	-.13662
Customer Service	.0144	.1819	.11834	.02755	.11535
Transportation and Safety	.0109	.1928	.10421	.02660	.10499
Biology	.0070	.1998	-.08198	.02633	-.08349
6. Oral Communication					
Customer Service	.1868	.1868	.42256	.02426	.41910
Equipment Maintenance and Repair	.0749	.2617	-.24905	.02226	-.26866
Management	.0348	.2965	.17480	.02246	.18680
Design and Drafting	.0272	.3237	-.15438	.02285	-.16221
Production and Processing	.0220	.3457	-.14974	.02454	-.14673

Table 10 (3 of 4)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Transportation and Safety	.0084	.3541	.08904	.02342	.09128
Biology	.0044	.3585	.06417	.02318	.06650
7. Equipment Control					
Design and Drafting	.0299	.0299	-.16240	.02662	-.17678
Equipment Maintenance and Repair	.0162	.0461	.11264	.02592	.12588
Customer Service	.0077	.0538	-.07961	.02825	-.08180
Biology	.0068	.0606	.07777	.02700	.08349
Production and Processing	.0033	.0639	.05691	.02858	.05777
8. Creativity					
Design and Drafting	.2183	.2183	.44864	.02220	.47506
Equipment Maintenance and Repair	.0585	.2768	-.21818	.02162	-.23720
Management	.0336	.3104	.17785	.02183	.19155
Information Processing and Communications	.0271	.3375	-.15352	.02192	-.16468
Production and Processing	.0162	.3537	-.12846	.02383	-.12686
Transportation and Safety	.0155	.3692	-.12092	.02275	-.12493
Biology	.0129	.3821	-.10643	.02252	-.11115
Customer Service	.0037	.3858	.06125	.02356	.06122
9. Perceptual Speed					
Equipment Maintenance and Repair	.0936	.0936	-.27033	.02397	-.05598
Transportation and Safety	.0425	.1361	-.19461	.02498	-.20471
Biology	.0406	.1766	-.18771	.02471	-.19960

Table 10 (4 of 4)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
Design and Drafting	.0336	.2102	-.17205	.02438	-.18549
Production and Processing	.0131	.2233	.11505	.02614	.11568
Information Processing and Communications	.0049	.2282	.06585	.02407	.07191
Management	.0031	.2313	-.05105	.02397	-.05598
10. Numerical Ability					
Production and Processing	.1394	.1394	.37822	.02492	.37229
Biology	.1070	.2464	-.31298	.02354	-.32580
Design and Drafting	.0381	.2845	.18071	.02321	.19072
Customer Service	.0161	.3006	.12651	.02464	.12605
Equipment Maintenance and Repair	.0132	.3138	.10613	.02261	.11500
Information Processing and Communications	.0088	.3226	.08544	.02292	.09134
Management	.0067	.3294	.07586	.02283	.08143
Transportation and Safety	.0035	.3329	.05749	.02378	.05920

Table 11 (1 of 5) (Abstract/Concrete) Stepwise Regression Analysis for Ability Level: Partial R-Square, Model R-Square, Unstandardized Beta (*B*), Standard Error (*SE B*), and Standardized Beta (ß)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
1. General Cognitive Ability					
Analyzing and Problem Solving	.5418	.5418	.31451	.02900	.31303
Management	.1790	.7208	.44650	.01934	.44046
Information Processing and Communications	.0215	.7423	.32417	.02557	.31850
Biology	.0189	.7612	.20702	.01812	.19804
Design and Drafting	.0135	.7748	.13141	.01783	.12745
Transportation and Safety	.0028	.7776	.04250	.01512	.04022
Production and Processing	.0025	.7800	-.05840	.01556	-.05283
Equipment Maintenance and Repair	.0017	.7817	.06826	.01731	.06797
Visioning and Evaluation	.0015	.7832	.05961	.01765	.05858
Sales and Marketing	.0012	.7844	.05199	.02061	.05047
2. General Physical Ability					
Information Processing and Communications	.2579	.2579	-.50582	.02324	-.50080
Equipment Maintenance and Repair	.0702	.3281	.24334	.02327	.24418
Production and Processing	.0321	.3603	-.23852	.02932	.15048
Design and Drafting	.0299	.3901	.15059	.02532	.14719
Transportation and Safety	.0208	.4109	.15779	.02392	.15048
Biology	.0080	.4189	.13602	.02815	.13112
Service	.0047	.4237	-.09319	.03403	-.09098
Management	.0027	.4264	-.05281	.02301	-.05250

Table 11 (2 of 5)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
3. Equipment-Related Far Visual Ability					
Transportation and Safety	.4177	.4177	.64664	.02278	.63676
Customer Service	.0179	.4357	-.17767	.02627	-.16926
Sales and Marketing	.0072	.4428	-.08099	.02344	-.08181
Analyzing and Problem-Solving	.0047	.4476	-.22093	.04012	-.22880
Visioning and Evaluation	.0049	.4524	.07091	.02254	.07251
Information Processing and Communications	.0020	.4545	.14007	.03677	.14320
Biology	.0028	.4572	.12602	.03356	.12544
Production and Processing	.0020	.4593	-.09450	.02824	-.08894
Service	.0043	.4636	-.09792	.03288	-.09871
4. Manual Ability					
Equipment Maintenance and Repair	.1702	.1702	.36952	.02633	.37611
Management	.0739	.2441	-.24783	.02502	-.24990
Transportation and Safety	.0673	.3114	-.26276	.02347	-.25418
Design and Drafting	.0414	.3527	.19278	.02311	.19112
Production and Processing	.0378	.3905	.21625	.02456	.19995
Biology	.0233	.4138	.14702	.02392	.14375
Customer Service	.0153	.4290	.14677	.02501	.13736
Sales and Marketing	.0026	.4317	-.07049	.03099	-.06994

Table 11 (3 of 5)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
5. Auditory Ability					
Equipment Maintenance and Repair	.0787	.0787	.30179	.02594	.31993
Design and Drafting	.0685	.1472	-.21951	.02855	-.22665
Production and Processing	.0203	.1675	-.08723	.03280	-.08400
Customer Service	.0144	.1819	.07082	.02920	.06903
Transportation and Safety	.0109	.1928	.08370	.02683	.08433
Biology	.0070	.1998	-.15166	.03171	-.15445
Service	.0103	.2101	.14481	.03883	.14936
Visioning and Evaluation	.0047	.2148	.06970	.02697	.07292
6. Oral Communication					
Service	.2220	.2220	.29531	.02788	.30994
Customer Service	.1129	.3349	.24814	.02588	.24611
Equipment Maintenance and Repair	.0440	.3789	-.15113	.02145	-.16303
Management and Development	.0371	.4160			
Analyzing and Problem-Solving	.0152	.4312	-.47278	.04807	-.50976
Information Processing and Communications	.0158	.4470	.31304	.03977	.33319
Management	.0081	.4551	.26942	.02479	.28791
Transportation and Safety	.0025	.4577	.05960	.02178	.06110
Visioning and Evaluation	.0029	.4606	-.10779	.02456	-.11474
Management & Development *(removed)*	.0004	.4602			
Design and Drafting	.0051	.4653	.10538	.02709	.11072
Biology	.0044	.4697	.09653	.03169	.10004

Table 11 (4 of 5)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
7. Equipment Control					
Design and Drafting	.0299	.0299			
Equipment Maintenance and Repair	.0162	.0461	.22276	.03099	.24895
Service	.0125	.0585	.19963	.03953	.21706
Production and Processing	.0161	.0746	.12274	.03367	.12460
Customer Service	.0158	.0904	-.23659	.03214	-.24311
Visioning and Evaluation	.0107	.1011	.09031	.02678	.09969
Analyzing and Problem-Solving	.0054	.1064	-.27782	.04830	-.31034
Information Processing and Communications	.0069	.1134	.17430	.04370	.19220
Design and Drafting *(removed)*	.0022	.1112			
Biology	.0032	.1144	.09336	.04001	.10024
Sales and Marketing	.0039	.1184	.07280	.03266	.07931
8. Creativity					
Design and Drafting	.2183	.2183	.47498	.02297	.50295
Equipment Maintenance and Repair	.0585	.2768	-.18976	.02132	-.20629
Analyzing and Problem-Solving	.0354	.3122	-.19583	.02238	-.21280
Management	.0505	.3627			
Transportation and Safety	.0191	.3817	-.17055	.02225	-.17621
Production and Processing	.0193	.4010	-.16274	.02311	-.16071
Visioning and Evaluation	.0197	.4207	.21001	.02192	.22532
Management and Development	.0086	.4293	.16995	.02109	.18386
Management (removed)	.0001	.4292			

Table 11 (5 of 5)

Factors and Variables	Partial R-Square	Model R-Square	*B*	*SE B*	ß
9. Perceptual Speed					
Equipment Maintenance and Repair	.0936	.0936	-.36787	.03091	-.40717
Transportation and Safety	.0425	.1361	-.15911	.02527	-.16737
Biology	.0406	.1766			
Design and Drafting	.0336	.2102	-.20315	.03030	-.21901
Service	.0318	.2420	-.30628	.02847	-.32982
Information Processing and Communications	.0091	.2511	.26011	.03943	.28406
Analyzing and Problem-Solving	.0101	.2612	-.18132	.04285	-.20060
Biology (removed)	.0001	.2611			
Visioning and Evaluation	.0027	.2638	-.11043	.02972	-.12062
Customer Service	.0029	.2667	.10197	.03135	.10377
Sales and Marketing	.0045	.2712	-.13723	.03686	-.14808
Management	.0049	.2761	.08902	.03259	.09761
10. Numerical Ability					
Production and Processing	.1394	.1394	.38321	.02490	.37720
Biology	.1070	.2464	-.38547	.02638	-.40127
Design and Drafting	.0381	.2845	.11196	.02553	.11817
Customer Service	.0161	.3006	.20914	.02701	.20837
Analyzing and Problem-Solving	.0144	.3150	.16628	.02782	.18010
Management and Development	.0097	.3247	.09477	.02298	.10219
Sales and Marketing	.0077	.3324	-.09657	.02510	-.10202
Transportation and Safety	.0054	.3378	.07153	.02384	.07366

using three different sets of predictors: Level-Abstract, Level-Concrete, and Level-Abstract and Level-Concrete combined, respectively. These tables present Partial R-Squares, Model R-Squares, Unstandardized Betas, Standard Error, and Standardized Betas for each variable included and/or removed from each of the models.

Preparatory to Regression Analysis C, the results of Regression Analyses A and B were examined to determine which set of factors yielded the highest R^2 when predicting Ability factors. It was concluded that the domain factors (i.e., knowledges, skills, and GWAs) of Importance and Level produced consistently higher R^2 than the Abstract factors and Concrete factors. The domain R^2's were also higher than those produced by combining the Abstract and Concrete factors. Therefore, the only factors used for the remaining analyses were the domain factors. Tables 12 and 13 show the multiple correlation coefficients for the Domain, Abstract, Concrete, and Abstract/Concrete factors for Ability-Importance and Ability-Level, respectively.

Regression Analysis C

A regression equation containing knowledges, skills, and GWAs as predictors was derived for each of the 52 individual abilities on both the Importance and Level scales, yielding a total of 104 R^2's for two scales and 52 abilities. For the Importance scale, half of the R^2 were greater than .50, and the highest seven were above .70 (i.e., Oral Expression, .8314; Speech Clarity, .8135; Written Expression, .7856; Oral Comprehension, .7488; Fluency of Ideas, .7223; Inductive Reasoning, .7140; and Control Precision, .7080). The 14 weakest R^2 were centered around .30. Among these were Hearing Sensitivity (.3085), Category Flexibility (.3051), Selective Attention (.2902), and Trunk Strength (.2621). The 52 R^2 values for the Importance scale are shown in Table 14.

Table 12 (Ability Importance) Multiple Correlations (R) for Domain, Concrete, Abstract, and Concrete/Abstract

Ability – Importance Factor Titles	Domain	Concrete	Abstract	Concrete/Abstract
1. General Physical Ability	.640	.635	.482	.640
2. Verbal Ability	.827	.787	.779	.812
3. Equipment-Related Far Visual Ability	.693	.708	.278	.719
4. Manual Ability	.669	.655	.377	.678
5. Closure Ability	.588	.443	.481	.519
6. Auditory Ability	.489	.445	.239	.476
7. Reasoning & Problem-Solving	.769	.682	.699	.743
8. Numerical Ability	.727	.649	.453	.670
9. Creativity	.819	.689	.720	.785
10. Equipment Control	.433	.432	.275	.458

Table 13 (Ability Level) Multiple Correlations (R) for Domain, Concrete, Abstract, and Concrete/Abstract

Ability – Level Factor Titles	Domain	Concrete	Abstract	Concrete/Abstract
1. General Cognitive Ability	.893	.875	.871	.886
2. General Physical Ability	.634	.650	.368	.653
3. Equipment-Related Far Visual Ability	.623	.660	.171	.681
4. Manual Ability	.654	.655	.475	.657
5. Auditory Ability	.457	.447	.187	.463
6. Oral Communication	.695	.599	.619	.685
7. Equipment Control	.335	.253	.157	.344
8. Creativity	.766	.621	.344	.655
9. Perceptual Speed	.564	.481	.274	.525
10. Numerical Ability	.600	.577	.361	.581

Table 14 (Importance) - Model R-Squares for Individual Ability Requirements

Ability Requirements	**Model R-Square**
1. Oral Comprehension	.7488
2. Written Comprehension	.6634
3. Oral Expression	.8314
4. Written Expression	.7856
5. Fluency of Ideas	.7223
6. Originality	.6861
7. Problem Sensitivity	.5571
8. Deductive Reasoning	.6720
9. Inductive Reasoning	.7140
10. Information Ordering	.3154
11. Category Flexibility	.3051
12. Mathematical Reasoning	.6306
13. Number Facility	.5937
14. Memorization	.3260
15. Speed of Closure	.5381
16. Flexibility of Closure	.3974
17. Perceptual Speed	.3307
18. Spatial Orientation	.4248
19. Visualization	.6022
20. Selective Attention	.2902
21. Time Sharing	.4051
22. Arm-Hand Steadiness	.5597
23. Manual Dexterity	.6723
24. Finger Dexterity	.5140
25. Control Precision	.7080
26. Multi-limb Coordination	.5787
27. Response Orientation	.4217
28. Rate Control	.4104
29. Reaction Time	.4681
30. Wrist-Finger Dexterity	.3505
31. Speed of Limb Movement	.4758
32. Static Strength	.6145
33. Explosive Strength	.5434
34. Dynamic Strength	.5470
35. Trunk Strength	.2621
36. Stamina	.4111
37. Extent Flexibility	.5484
38. Dynamic Flexibility	.4490
39. Gross Body Coordination	.3958
40. Gross Body Equilibrium	.3558
41. Near Vision	.3345
42. Far Vision	.4707
43. Visual Color Discrimination	.3373
44. Night Vision	.4182
45. Peripheral Vision	.3834
46. Depth Perception	.4505
47. Glare Sensitivity	.3630
48. Hearing Sensitivity	.3085
49. Auditory Attention	.4182
50. Sound Localization	.3223
51. Speech Recognition	.6454
52. Speech Clarity	.8135

Similar results were found for the Level scale; however, there was a greater concentration of R^2 at the high and low ends for this scale. For example, whereas the Importance scale yielded only seven R^2's above .70, there were 10 above that value for the Level scale. The highest of these were for Written Expression (.8689), Oral Expression (.8523), Written Comprehension (.8200), and Oral Comprehension (.8138). Among the lowest R^2's for Level were Selective Attention (.2994), Perceptual Speed (.2402), Hearing Sensitivity (.2373), and Wrist-Finger Dexterity (.1700). The 52 R^2 values for the Level scale are shown in Table 15.

Analysis D

The regression equations derived in Analysis C were used to obtain a predicted ability rating (Y) for the individual abilities. From these predicted ability ratings, an intercorrelation matrix was then computed for each scale.

The predicted ability ratings (Ys) for both scales were then factor analyzed, and a seven-factor solution was derived accounting for 94.56% and 96.32% of the total variance for the Importance and Level scales, respectively. The principle components method was used to determine the number of factors to rotate for each scale. This process was facilitated by the application of Kaiser's rule which states that any factor with an Eigenvalue = 1.00 should be included in the factor rotation (Kaiser, 1958). Based on Kaiser's criterion and an examination of alternative rotation solutions, it was determined that a seven-factor solution should be retained for both Ability-Importance and Ability-Level. Tables 16 and 17 show the factors and their loadings for Ability-Importance and Ability-Level, respectively. Upon completion of the factor rotation, the resultant factors for the Ys were compared to Wadden's original 10 factors (based on actual Y values) to

Table 15 (Level) - Model R-Squares for Individual Ability Requirements

Ability Requirements	**Model R-Square**
1. Oral Comprehension	.8138
2. Written Comprehension	.8200
3. Oral Expression	.8523
4. Written Expression	.8689
5. Fluency of Ideas	.7699
6. Originality	.7051
7. Problem Sensitivity	.7055
8. Deductive Reasoning	.7881
9. Inductive Reasoning	.7635
10. Information Ordering	.5195
11. Category Flexibility	.4605
12. Mathematical Reasoning	.6835
13. Number Facility	.6669
14. Memorization	.4425
15. Speed of Closure	.5274
16. Flexibility of Closure	.4142
17. Perceptual Speed	.2402
18. Spatial Orientation	.4144
19. Visualization	.5184
20. Selective Attention	.2994
21. Time Sharing	.4206
22. Arm-Hand Steadiness	.4857
23. Manual Dexterity	.5401
24. Finger Dexterity	.4118
25. Control Precision	.6498
26. Multi-limb Coordination	.5546
27. Response Orientation	.3902
28. Rate Control	.4309
29. Reaction Time	.4640
30. Wrist-Finger Dexterity	.1700
31. Speed of Limb Movement	.4420
32. Static Strength	.6119
33. Explosive Strength	.5411
34. Dynamic Strength	.5459
35. Trunk Strength	.3358
36. Stamina	.4378
37. Extent Flexibility	.5272
38. Dynamic Flexibility	.4418
39. Gross Body Coordination	.3414
40. Gross Body Equilibrium	.3530
41. Near Vision	.3550
42. Far Vision	.4277
43. Visual Color Discrimination	.3507
44. Night Vision	.3924
45. Peripheral Vision	.4096
46. Depth Perception	.4731
47. Glare Sensitivity	.3512
48. Hearing Sensitivity	.2373
49. Auditory Attention	.3040
50. Sound Localization	.3258
51. Speech Recognition	.6144
52. Speech Clarity	.7586

Table 16 (1 of 3) (Ability Importance) Seven-Factor Solution: Factor Titles, Salient Skills, and Percentages of Variance Explained

Factor Title and O*NET Importance Abilities	Factor Loading	% Variance
1. General Physical Ability vs. Verbal Ability (37)		31.12%
23. Manual dexterity	.94	
24. Finger dexterity	.94	
22. Arm-hand steadiness	.93	
37. Extent flexibility	.84	
30. Wrist-finger dexterity	.83	
38. Dynamic flexibility	.81	
26. Multi-limb coordination	.80	
25. Control precision	.80	
34. Dynamic strength	.79	
33. Explosive strength	.79	
31. Speed of limb movement	.78	
32. Static strength	.77	
35. Trunk strength	.74	
43. Visual color discrimination	.70	
19. Visualization	.69	
40. Gross body equilibrium	.62	
39. Gross body coordination	.61	
36. Stamina	.57	
46. Depth perception	.55	
28. Rate control	.53	
10. Information ordering	.51	
29. Reaction time	.45	
50. Sound localization	.31	
27. Response orientation	.30	
13. Number facility	-.34	
15. Speed of closure	-.36	
09. Inductive reasoning	-.39	
05. Fluency of ideas	-.40	
12. Mathematical reasoning	-.40	
49. Auditory attention	-.40	
14. Memorization	-.41	
02. Written comprehension	-.54	
51. Speech recognition	-.63	
03. Oral expression	-.64	
01. Oral comprehension	-.64	
52. Speech clarity	-.66	
04. Written expression	-.66	
2. Sensory-Motor Ability (26)		21.06%
47. Glare sensitivity	.96	
44. Night vision	.94	
42. Far vision	.94	

Table 16 (2 of 3)

Factor Title and O*NET Importance Abilities	Factor Loading	% Variance
18. Spatial orientation	.93	
45. Peripheral vision	.90	
46. Depth perception	.80	
27. Response orientation	.75	
28. Rate control	.75	
29. Reaction time	.73	
40. Gross body equilibrium	.64	
50. Sound localization	.62	
39. Gross body coordination	.62	
36. Stamina	.58	
26. Multi-limb coordination	.49	
35. Trunk strength	.49	
31. Speed of limb movement	.46	
48. Hearing sensitivity	.46	
32. Static strength	.45	
21. Time sharing	.43	
37. Extent flexibility	.42	
33. Explosive strength	.41	
20. Selective attention	.37	
34. Dynamic strength	.36	
16. Flexibility of closure	.35	
49. Auditory attention	.33	
25. Control precision	.31	
3. General Cognitive Ability (24)		18.29%
16. Flexibility of closure	.87	
08. Deductive reasoning	.86	
41. Near vision	.84	
09. Inductive reasoning	.82	
15. Speed of closure	.81	
11. Category flexibility	.81	
07. Problem sensitivity	.75	
10. Information ordering	.75	
17. Perceptual speed	.75	
02. Written comprehension	.63	
12. Mathematical reasoning	.60	
04. Written expression	.57	
13. Number facility	.53	
20. Selective attention	.43	
05. Fluency of ideas	.43	
14. Memorization	.42	
06. Originality	.35	
21. Time sharing	.35	
43. Visual color discrimination	.30	
32. Static strength	-.30	
34. Dynamic strength	-.32	
35. Trunk strength	-.35	
38. Dynamic flexibility	-.35	
36. Stamina	-.42	

Table 16 (3 of 3)

Factor Title and O*NET Importance Abilities	Factor Loading	% Variance
4. Auditory Ability & Oral Communication (16)		11.78%
49. Auditory attention	.79	
20. Selective attention	.73	
21. Time sharing	.70	
51. Speech recognition	.70	
52. Speech clarity	.65	
03. Oral expression	.65	
14. Memorization	.64	
48. Hearing sensitivity	.64	
01. Oral comprehension	.64	
50. Sound localization	.62	
27. Response orientation	.42	
07. Problem sensitivity	.41	
04. Written expression	.39	
02. Written comprehension	.34	
15. Speed of closure	.32	
05. Fluency of ideas	.30	
5. Creativity (4)		5.91%
06. Originality	.83	
05. Fluency of ideas	.73	
19. Visualization	.60	
43. Visual color discrimination	.40	
6. Clerical Ability (4)		3.34%
17. Perceptual speed	.45	
41. Near vision	.40	
30. Wrist-finger dexterity	.35	
43. Visual color discrimination	.32	
7. Numerical Ability (4)		3.06%
13. Number facility	.71	
12. Mathematical reasoning	.61	
10. Information ordering	.30	

Table 17 (1 of 3) (Ability Level) Seven-Factor Solution: Factor Titles, Salient Skills, and Percentages of Variance Explained

Factor Title and O*NET Level Abilities	Factor Loading	% Variance
1. General Cognitive Ability vs. Verbal Ability (25)		35.31%
08. Deductive reasoning	.97	
09. Inductive reasoning	.97	
15. Speed of closure	.95	
10. Information ordering	.94	
07. Problem sensitivity	.94	
11. Category flexibility	.93	
02. Written comprehension	.91	
12. Mathematical reasoning	.88	
16. Flexibility of closure	.88	
04. Written expression	.87	
13. Number facility	.87	
14. Memorization	.86	
41. Near vision	.84	
01. Oral comprehension	.83	
05. Fluency of ideas	.82	
03. Oral expression	.79	
20. Selective attention	.77	
17. Perceptual speed	.76	
06. Originality	.76	
52. Speech clarity	.69	
21. Time sharing	.68	
51. Speech recognition	.52	
49. Auditory attention	.46	
42. Far vision	.41	
19. Visualization	.37	
2. Sensory-Motor Ability (29)		30.39%
45. Peripheral vision	.97	
47. Glare sensitivity	.95	
18. Spatial orientation	.93	
44. Night vision	.90	
46. Depth perception	.89	
40. Gross body equilibrium	.87	
28. Rate control	.86	
39. Gross body coordination	.84	
27. Response orientation	.83	
42. Far vision	.83	
50. Sound localization	.83	
29. Reaction time	.82	
36. Stamina	.77	
26. Multi-limb coordination	.73	
33. Explosive strength	.72	

Table 17 (2 of 3)

Factor Title and O*NET Level Abilities	Factor Loading	% Variance
35. Trunk strength	.70	
31. Speed of limb movement	.70	
32. Static strength	.69	
34. Dynamic strength	.66	
48. Hearing sensitivity	.64	
37. Extent flexibility	.64	
38. Dynamic flexibility	.60	
49. Auditory attention	.55	
25. Control precision	.49	
21. Time sharing	.43	
23. Manual dexterity	.42	
20. Selective attention	.35	
16. Flexibility of closure	.30	
22. Arm-hand steadiness	.30	
3. General Physical Ability vs. Verbal Ability (27)		17.31
24. Finger dexterity	.96	
22. Arm-hand steadiness	.87	
43. Visual color discrimination	.85	
30. Wrist-finger dexterity	.82	
23. Manual dexterity	.81	
25. Control precision	.79	
19. Visualization	.62	
37. Extent flexibility	.56	
26. Multi-limb coordination	.53	
38. Dynamic flexibility	.47	
31. Speed of limb movement	.45	
34. Dynamic strength	.44	
33. Explosive strength	.43	
32. Static strength	.39	
48. Hearing sensitivity	.38	
29. Reaction time	.37	
46. Depth perception	.37	
35. Trunk strength	.36	
28. Rate control	.35	
39. Gross body coordination	.32	
40. Gross body equilibrium	.30	
10. Information ordering	.30	
04. Written expression	-.35	
01. Oral comprehension	-.38	
03. Oral expression	-.45	
52. Speech clarity	-.51	
51. Speech recognition	-.55	

Table 17 (3 of 3)

Factor Title and O*NET Level Abilities	Factor Loading	% Variance
4. Auditory Ability (9)		5.17%
49. Auditory attention	.64	
51. Speech recognition	.59	
48. Hearing sensitivity	.53	
52. Speech clarity	.45	
50. Sound localization	.44	
21. Time sharing	.44	
20. Selective attention	.44	
03. Oral expression	.36	
27. Response orientation	.35	
5. Strength (8)		3.36%
35. Trunk strength	.42	
32. Static strength	.41	
33. Explosive strength	.37	
34. Dynamic strength	.36	
36. Stamina	.34	
38. Dynamic flexibility	.33	
37. Extent flexibility	.29	
41. Near vision	-.33	
6. Creativity (5)		3.34%
19. Visualization	.62	
06. Originality	.57	
05. Fluency of ideas	.45	
29. Reaction time	-.32	
17. Perceptual speed	-.38	
7. Numerical Ability (1)		1.44%
13. Number facility	.32	

identify Y factors that appeared to (a) match directly with Wadden's Y factors, (b) represent mergers of the original Y factors, or (c) represent factors that did not emerge in Wadden's solution. In naming the Y factors, the investigator tried to maintain consistency with Wadden's original interpretations.

Finally, congruence coefficients were computed to compare Wadden's original ability factor structure, which were derived from actual ratings, with the factors obtained in this study, which were derived from the predicted ratings. Table 18 shows the resultant coefficients of congruence for the Importance scale. For the Importance scale, the highest coefficients among all possible cross-study pairings of factors between this study and Wadden's had a range .96 to -.41. Table 19 shows the coefficients of congruence from the cross-study comparison of factors based on the Level scale. For the Level scale, the highest coefficients ranged from .97 to .64.

Discussion

Among the resultant R^2's from the conducted analyses, some were substantial while others proved insufficient for prediction purposes. Below is an analysis-by-analysis breakdown of these R^2's and their corresponding R's. For purposes of this study, an R^2 above .56 was considered substantial; thus any R of .75 or greater would be considered potentially useful for prediction.

Analysis A

The first part of the study sought to determine which set of factors (i.e., Domain or Concrete and Abstract) best predicted Wadden's ability factors. Using the R cut-off mentioned above, only a few of Wadden's ability factors were predictable from the other domain factors (i.e., Knowledges, Skills, GWAs). For the Level scale, General Cognitive

Table 18 (Importance) Congruence Coefficients for Factors Derived from Actual Ability Ratings and Factors Derived from Predicted Ratings

	Factors Derived from Actual Ratings (Importance)				
Factors Derived from Predicted Ratings	**1. General Physical Ability**	**2. Verbal Ability**	**3. Equipment-Related Far Visual Ability**	**4. Manual Ability**	**5. Closure Ability**
1. General Physical Ability vs. Verbal Ability	0.86*	-0.63	0.33	0.80*	-0.09
2. Sensory Motor Ability	0.73	0.04	0.96*	0.31	0.18
3. General Cognitive Ability	-0.35	0.63	0.10	0.10	0.87*
4. Auditory Ability & Oral Communication	-0.17	0.89*	0.36	-0.17	0.53
5. Creativity	-0.35	0.52	-0.08	-0.11	0.29
6. Clerical Ability	-0.41	-0.01	-0.08	0.30	0.32
7. Numerical Ability	-0.33	0.44	-0.21	-0.17	0.29

	Factors Derived from Actual Ratings (Importance)				
Factors Derived from Predicted Ratings	**6. Auditory Ability**	**7. Reasoning & Problem-Solving**	**8. Numerical Ability**	**9. Creativity**	**10. Equipment Control**
1. General Physical Ability vs. Verbal Ability	0.16	-0.26	-0.38	-0.29	0.30
2. Sensory Motor Ability	0.59	0.09	-0.21	-0.11	0.49
3. General Cognitive Ability	0.28	0.83*	0.67	0.01	0.10
4. Auditory Ability & Oral Communication	0.69	0.49	0.32	0.29	0.31
5. Creativity	-0.12	0.41	0.36	0.94*	-0.40
6. Clerical Ability	0.03	-0.17	0.07	-0.08	0.14
7. Numerical Ability	-0.29	0.23	0.87*	0.27	-0.08

* - Denotes a congruence coefficient of .80 or higher.

Table 19 (Level) Congruence Coefficients for Factors Derived from Actual Ability Ratings and Factors Derived from Predicted Ratings

	Factors Derived from Actual Ratings (Level)				
Factors Derived from Predicted Ratings	**1. General Cognitive Ability**	**2. General Physical Ability**	**3. Equipment-Related Far Visual Ability**	**4. Manual Ability**	**5. Auditory Ability**
1. General Cognitive Ability	0.97*	-0.35	0.22	-0.06	0.31
2. Sensory Motor Ability	-0.04	0.89*	0.87*	0.48	0.64
3. General Physical vs. Verbal Ability	-0.28	0.69	0.25	0.92*	0.18
4. Auditory Ability	0.50	-0.14	0.38	-0.13	0.76
5. Strength	-0.36	0.66	-0.07	0.19	-0.04
6. Creativity	0.30	-0.09	-0.05	-0.15	-0.24
7. Numerical Ability	-0.06	0.03	-0.05	0.16	0.08

	Factors Derived from Actual Ratings (Level)				
Factors Derived from Predicted Ratings	**6. Oral Communication**	**7. Equipment Control**	**8. Creativity**	**9. Perceptual Speed**	**10. Numerical Ability**
1. General Cognitive Ability	0.32	0.09	0.27	0.29	0.27
2. Sensory Motor Ability	-0.10	0.44	-0.10	0.03	-0.13
3. General Physical vs. Verbal Ability	-0.54	0.17	-0.14	0.00	-0.04
4. Auditory Ability	0.69	0.39	0.06	0.19	0.05
5. Strength	-0.22	0.10	-0.11	-0.42	-0.18
6. Creativity	0.25	-0.38	0.89*	-0.13	0.14
7. Numerical Ability	-0.33	0.25	-0.26	-0.12	0.64

* - Denotes a congruence coefficient of .80 or higher.

Ability and Creativity produced R's of .893 and .766, respectively. The Importance scale yielded three substantial R's: Verbal Ability, .827; Creativity, .819; and Reasoning & Problem-Solving, .769. Although it did not meet the cut-off for this study, Numerical Ability produced an R of .727, and further research may demonstrate that this ability factor can be adequately predicted by the domain factors. Based on average R's for the factors using the two different scales, the domain factors using the Importance scale were slightly better predictors of the ability factors than those using the Level scale. Average R's for the two scales were .677 for Importance and .639 for Level. The proclivity for higher R's on the Importance scale versus the Level scale was an emerging theme of this study and will be addressed again later in the discussion.

Analysis B

The concrete and abstract factors were almost as good as the domain factors at predicting ability factors. Importance-Concrete and Importance-Abstract factors were only able to predict the Verbal Ability factor, producing R's of .787 and .779, respectively. Combining Importance-Concrete and Importance-Abstract factors to predict ability factors only increased prediction slightly, producing two R's that exceeded the cut-off: Verbal Ability, .812 and Creativity, .785. In addition, Reasoning & Problem-Solving was very close to the cut-off with an R of .743. Overall, combining the Importance-Abstract factors with Importance-Concrete factors only raised the R's produced by Importance-Concrete factors alone by an average of .037.

Both the Level-Concrete and Level-Abstract factors were able to predict General Cognitive Ability with R's of .875 and .871, respectively. Combining Level-Concrete and Level-Abstract only raised the R for General Cognitive Ability to .886. No other R's

exceeded or approached the R cut-off of .75. Once again, the combination of Concrete and Abstract factors as predictors of abilities only raised the R's slightly with an average increase of .027. Overall, the Concrete factors were better predictors than the Abstract factors and predicted the ability factors almost as well as the Concrete and Abstract factors combined.

But how well do Concrete factors predict compared to the domain factors? This was worth a closer look because if the Concrete factors proved to be better predictors than the domain factors, then the total number of ratings required to estimate ability requirements would be significantly reduced without losing any predictability. Based on examination of the average R's for the Importance and Level scales, the domain factors were only slightly better predictors than the Concrete factors. For the domain factors and the Concrete factors of the Importance scale, the average R's were .677 and .639, respectively, and for the same factors on the Level scale, the average R's were .639 and .602, respectively. However, it should be noted that only two ability factors were predicted by both the domain factors and Concrete factors: one ability factor from the Importance scale (e.g., Verbal Ability) and one factor from the Level scale (e.g., General Cognitive Ability). Although the domain factors produced higher R's (Verbal Ability, .827 and General Cognitive Ability, .893) than the Concrete factors (Verbal Ability, .787 and General Cognitive Ability, .875), the differences were relatively small. Thus, it may prove beneficial to use the Concrete factors to predict certain selected abilities, thereby reducing the number of required ratings.

It became evident that in some cases the cognitive factors were more predictable than the factors involving physical and technical abilities, but this finding was not

necessarily surprising. Cunningham and Scott (1988) found similar results when they used Occupation Analysis Inventory (OAI) and United States Employment Services (USES) job-rating variable clusters to predict mean General Aptitude Test Battery (GATB) test scores for representative samples of job incumbents. In that study, mean incumbent scores for 434 jobs on eight GATB tests were condensed to two factors: Cognitive Ability and Sensory Motor Ability. Using the job variable cluster scores as predictors of the resultant GATB factors, the investigators obtained higher R's for the GATB Cognitive Ability factor (.79 for USES job variables; .75 for OAI job variables) than the for the GATB Sensory Motor Ability factor (.31 for USES job variables; .24 for OAI job-rating variables). In addition, Scott and Cunningham used the OAI job-rating variable clusters to predict scores on the USES job-rating variable clusters, two of which were titled "Cognition" and "Motor." In these analyses, an R of .84 was obtained for the USES Cognition cluster and an R of .59 was obtained for the USES Motor cluster. One possible explanation for these findings was that cognitive abilities tend to be more highly correlated with each other than physical abilities. However, their study also found that these results were reversed when using validity coefficients instead of mean test scores, but why this occurred is beyond the scope of this study.

A closer inspection of the Importance and Level scales for the Concrete and Abstract once again demonstrated that the Importance scale is a somewhat better predictor of abilities than the Level scale. The average R's for the Importance scale across the ability factors were .624 for Importance-Concrete, .514 for Importance-Abstract, and .661 for the Importance-Concrete/Abstract factor combination. The average R's for the Level scale across the same factors were .602 for Level-Concrete, .438 for

Level-Abstract, and .629 for the Level-Concrete/Abstract factor combination. When these R's were merged with those derived for the domain factors, the overall average R for the Importance scale was .622, compared to an average R of .583. A side-by-side comparison of the R's for the domain, Concrete, Abstract, and Concrete/Abstract factors are presented in Tables 12 and 13 for the Importance and Level scales, respectively. Because the domain factors were slightly better predictors of abilities than the Concrete and Abstract factors, only they were used for subsequent analyses. However, it may be worthwhile for future research to carry out analyses C and D using the Concrete and Abstract factors.

Analysis C

In the second part of this study, the domain factors were used to predict ratings for each of the 52 individual abilities on each of the two scales. The resultant regression equations were then used to produce 52 Ys for each individual occupational unit (OU). The overall results for the Importance and Level scales were similar, with average R^2 values of .502 for Importance and .507 for Level. Although the difference in average R^2 between the two scales was not significant, the domain factors for the Level scale were slightly better predictors than those for the Importance scale. In general, the highest R's were found for the individual abilities loading on cognitive factors. This only strengthened the point made earlier that cognitive ability factors and the individual ability requirements marking those factors are better predicted than the physical or technical abilities and their factors.

Surprisingly, the average R's for the individual ability requirements showed that they were better predicted than the ability factors. This was found for both the

Importance and Level scales. Recall that when domain factors were used as predictors, the average R's for the ability factors were .677 on the Importance scale and .639 on the Level scale, whereas the average R's for the 52 individual abilities were .708 for the Importance scale and .712 for the Level scale. A total of 21 ability requirements surpassed the R cut-off of .75 for the Importance scale, and 17 ability requirements exceeded the same cut-off for the Level scale. Interestingly, all 17 ability requirements for the Level scale were found in the set of 21 from the Importance scale. Therefore, the Importance scale proved to be a better overall predictor of individual ability requirements than the Level scale, even though their average R's were similar. Upon a closer inspection of the individual R's (in contrast to the average R's), a noticeable difference between the two scales was revealed. The Level scale generated higher R's for the cognitive ability requirements (e.g, Oral Expression, Deductive Reasoning, Fluency of Ideas, and Mathematical Reasoning) than did the Importance scale, whereas the Importance scale produced higher R's for the physical and motor abilities (e.g., Manual Dexterity, Static Strength, Multi-limb Coordination, and Arm-Hand Steadiness) and for abilities such as speech recognition and speech clarity. Among the least predictable ability requirements for both scales were strength, auditory, and manual abilities (e.g., Trunk Strength, Hearing Sensitivity, and Wrist-Finger Dexterity).

The majority of the individual ability requirements with R's of .75 and above were cognitive in nature, with some physical, motor, and strength ability requirements scattered throughout. This was true of both scales. It is unclear why the individual abilities were more predictable than were the ability factors. According to the Spearman-Brown prophecy principle, factor scores based on several ability ratings should have been

more reliable, and therefore produced higher R's, than did the individual ability ratings. One possible explanation may involve the degree of differentiation among the individual ability requirements, among the ability factors for the Importance scale, and among the ability factors for the Level scale. Of these three, the individual ability requirements were the most differentiated, while the ability factors for the Level scale were the least differentiated. The Importance ability factors were more differentiated than the ability factors for the Level scale because the Importance ability factors were more specific. For example, the Level scale produced one general cognitive ability factor (General Cognitive Ability); whereas, the Importance scale broke general cognition down into three factors (e.g., Verbal Ability, Closure Ability, and Reasoning & Problem-Solving). Thus, the Importance scale ability factors tended to be more specific than those for the Level scale, and for that reason more closely resembled the original individual ability requirements than did the Level-scale ability factors, which were more general in nature. The greater specificity of the individual ability requirements may have accounted for their better predictability.

Another possible explanation for this finding involves the reliabilities of the individual abilities loading on a factor. Factors with low R^2's for both the Importance and Level scales included numerous individual ability requirements with low reliabilities as determined by Wadden (1998). The factors marked by low-reliability ability variables could be expected to have low reliabilities themselves, thus attenuating their R^2's with the other domain factors. On the other hand, the individual ability requirements with low reliabilities could not affect the R^2's for the individual ability requirements with higher

reliabilities, and for that reason, these latter ability variables might be expected to have higher R^2's.

Analysis D

The Ys from Analysis C were factor analyzed, and the resultant factor structure was compared to the factor structures derived by Wadden (1998) from the actual ability-requirement ratings. These factor analyses produced reasonable factor structures but ones that contained fewer factors, with less practical differentiation, than Wadden's original structures. Of the factors derived from the predicted ability ratings, some were replications of the original ability factors, some were combinations of several original factors, and others were new factors that seemed to break off from more general original factors.

An examination of the congruence coefficients for the seven Importance scale factors derived from the predicted ability ratings showed that six of the those factors could be matched with at least one of the original ability factors. Clerical Ability was the only Y factor that did not produce a significant congruence coefficient. The remaining six Y factors were matched to all but two of the ten original ability factors (i.e., Auditory Ability and Equipment Control). A possible explanation for this finding is that some of the Y factors were more general, or inclusive, than their corresponding factors derived by Wadden. The congruence coefficients between the predicted ability factors as matched with Wadden's ability factors were fairly substantial, as shown below:

Y-Factor	Matched Y Factor	Congru. Coeff.
General Physical Ability	General Physical vs. Verbal Ability	.86
Manual Ability	General Physical vs. Verbal Ability	.80

Equip-Related Far Visual Ability	Sensory-Motor Ability	.96
Closure Ability	General Cognitive Ability	.87
Reasoning & Problem Solving	General Cognitive Ability	.83
Verbal Ability	Auditory Ability & Oral Communication	.89
Creativity	Creativity	.94
Numerical Ability	Numerical Ability	.89

Only five of Wadden's original ten Level scale ability factors could be matched with factors derived from the predicted Level scale ability ratings, and only four of the seven factors derived from the predicted ability ratings produced substantial congruence coefficients when compared to the original ability factors. The matched Y and Y factors and their coefficients of congruence are shown below:

Y-Factor	Matched Y Factor	Congru. Coeff.
General Cognitive Ability	General Cognitive Ability	.97
General Physical Ability	Sensory-Motor Ability	.89
Equip-Related Far Visual Acuity	Sensory-Motor Ability	.87
Manual Ability	General Physical vs. Verbal Ability	.92
Creativity	Creativity	.89

The Y Auditory Ability, Strength, and Numerical Ability factors failed to match any of Wadden's factors. Tables 16 and 17 show the complete matrix of congruence coefficients between Wadden's original factors and the factors derived from predicted ability ratings for the Importance and Level scales, respectively.

Between the Importance and Level scales, two similar bi-polar factors were produced from the predicted ability ratings. These factors had two distinct content

characteristics and shared a common name: General Physical Ability vs. Verbal Ability. The factors were interpreted as bi-polar because one of their two content characteristics (Verbal Ability) was marked by substantial negative loadings while the other (General Physical Ability) was marked by substantial positive factor loadings. The congruence coefficients presented above showed that the strongest matches for these bi-polar factors were Wadden's original Physical Ability factors. The congruence coefficients for the comparison with Wadden's Verbal Ability factors were relatively high but less substantial than those for her Physical Ability Factors. Once again, the Importance scale demonstrated an advantage over the Level scale by producing better matches with Wadden's original factors than did the Level scale. Factor differentiation was low for both scales in comparison to the original factor structure. Although the predicted ability-requirement ratings did not replicate the factor structures of the original ratings, there were some substantial relationships between the Y and original factors, particularly with the Importance scale.

Conclusion

It appears that the domain factors are better predictors of ability ratings than the concrete and abstract factors, and that the domain factors based on the Importance scale are somewhat better predictors than those from the Level scale. Moreover, the cognitive abilities proved to be somewhat more predictable than the motor, physical, and perceptual abilities. It was also apparent that the abilities with the highest inter-rater reliabilities in Wadden's study tended to have higher R's in this study than those with lower reliabilities. (The mean reliabilities in Wadden's study were .71 for the Importance scale and .74 for the Level Scale.) Among the 52 individual abilities, a total of 22 Importance-

scale and 17 Level-scale abilities were predictable with R's of .75 or greater. According to that arbitrary criterion, it would be practical to estimate requirements for those abilities with ratings on the other domain descriptors, thereby eliminating the necessity of collecting ratings on the more abstract ability descriptors. It is likely that the R's for many of the remaining abilities were attenuated by unreliability in their ratings. In the future, it might be feasible to improve the reliabilities of those descriptors by increasing the number of raters. Barring that option, future analyses could correct the individual abilities' R values for attenuation due to their unreliability. If the corrected R's were substantial, and if the reliabilities of the predictors were shown to be high, a sound argument might be made for estimating ability requirements from those predictors.

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Appendix A.

Factor Analyses of O*NET Domain Variables

Table A-1 (1 of 2) (Knowledge Level) Eight-Factor Solution: Factor Titles, Salient Knowledges, Percentages of Variance Explained, and Coefficients of Congruence

O*NET LEVEL: Factor Title and Knowledges	Factor Loading	% Variance	Cong. Coeff.
1. Management and Human Resources (11)		13.39%	.996
KN3 Economics and Accounting	.82		
KN1 Administration and Management	.81		
KN6 Personnel and Human Resources	.77		
KN4 Sales and Marketing	.58		
KN14 Mathematics	.56		
KN30 Legal, Government and Jurisprudence	.51		
KN23 Education and Training	.50		
KN24 English Language	.46		
KN18 Psychology	.46		
KN2 Clerical	.43		
KN32 Communications and Media	.40		
2. Applied Physical Sciences and Technology (6)		11.57%	.996
KN10 Engineering and Technology	.89		
KN11 Design	.78		
KN15 Physics	.77		
KN13 Mechanical	.73		
KN12 Building and Construction	.65		
KN7 Production and Processing	.52		
3. Humanities and Social Sciences (8)		9.96%	.992
KN27 History and Archeology	.82		
KN19 Sociology and Anthropology	.76		
KN28 Philosophy	.75		
KN25 Foreign Language	.50		
KN24 English Language	.46		
KN20 Geography	.43		
KN32 Communications and Media	.41		
KN23 Education and Training	.38		
4. Health Services (5)		8.08%	.989
KN22 Therapy and Counseling	.82		
KN18 Psychology	.69		
KN21 Medicine and Dentistry	.66		
KN5 Customer and Personal Service	.49		
KN23 Education and Training	.47		

Table A-1 (2 of 2)

O*NET LEVEL: Factor Title and Knowledges	Factor Loading	% Variance	Cong. Coeff.
5. Information Processing and Communications (6)		7.40%	.992
KN9 Computers and Electronics	.77		
KN31 Telecommunications	.59		
KN24 English Language	.54		
KN32 Communications and Media	.49		
KN14 Mathematics	.47		
KN2 Clerical	.44		
6. Transportation and Safety (5)		6.12%	.988
KN33 Transportation	.72		
KN20 Geography	.64		
KN29 Public Safety and Security	.63		
KN30 Legal, Government and Jurisprudence	.44		
KN31 Telecommunications	.39		
7. Biology (4)		5.89%	.975
KN17 Biology	.82		
KN16 Chemistry	.73		
KN21 Medicine and Dentistry	.49		
KN8 Food Protection	.48		
8. Fine Arts (2)		2.85%	.954
KN26 Fine Arts	.53		
KN4 Sales and Marketing	.41		

Table A-2 (1 of 2) (Knowledge Importance) Nine-Factor Solution: Factor Titles, Salient Knowledges, Percentages of Variance Explained, and Coefficients of Congruence

O*NET LEVEL: Factor Title and Knowledges	Factor Loading	% Variance	Cong. Coeff.
1.Applied Physical Sciences and Technology (5)		10.01%	.992
KN10 Engineering and Technology	.87		
KN15 Physics	.75		
KN11 Design	.73		
KN13 Mechanical	.60		
KN12 Building and Construction	.55		
2. Management and Human Resources (6)		8.12%	.987
KN1 Administration and Management	.80		
KN6 Personnel and Human Resources	.78		
KN23 Education and Training	.50		
KN3 Economics and Accounting	.48		
KN24 English Language	.39		
KN18 Psychology	.39		
3. Information Processing and Communications (6)		8.08%	.990
KN9 Computers and Electronics	.76		
KN24 English Language	.63		
KN32 Communications and Media	.57		
KN31 Telecommunications	.56		
KN2 Clerical	.54		
KN14 Mathematics	.46		
4. Health Services (5)		8.01%	.985
KN22 Therapy and Counseling	.81		
KN18 Psychology	.72		
KN21 Medicine and Dentistry	.63		
KN5 Customer and Personal Service	.49		
KN23 Education and Training	.48		
5. Humanities and Social Sciences (4)		7.80%	.993
KN27 History and Archeology	.77		
KN28 Philosophy	.71		
KN19 Sociology and Anthropology	.71		
KN25 Foreign Language	.42		

Table A-2 (2 of 2)

O*NET LEVEL: Factor Title and Knowledges	Factor Loading	% Variance	Cong. Coeff.
6. Transportation and Safety (5)		6.09%	.991
KN33 Transportation	.73		
KN20 Geography	.66		
KN29 Public Safety and Security	.64		
KN30 Legal, Government and Jurisprudence	.43		
KN31 Telecommunications	.41		
7. Biology (4)		5.42%	.973
KN17 Biology	.80		
KN16 Chemistry	.68		
KN21 Medicine and Dentistry	.48		
KN8 Food Production	.44		
8. Accounting and Sales (3)		4.44%	.979
KN3 Economics and Accounting	.60		
KN4 Sales and Marketing	.57		
KN14 Mathematics	.45		
9. Fine Arts (1)		2.69%	.947
KN26 Fine Arts	.57		

Table A-3 (1 of 3) (Skill Level) Five-Factor Solution: Factor Titles, Salient Skills, Percentages of Variance Explained, and Coefficients of Congruence

O*NET LEVEL: Factor Title and Skills	Factor Loading	% Variance	Cong. Coeff.
1. Thinking and Problem-Solving (31)		31.97%	.997
SK18 Information Gathering	.83		
SK19 Information Organization	.83		
SK8 Active Learning	.83		
SK20 Synthesis/Reorganization	.83		
SK1 Reading Comprehension	.82		
SK7 Critical Thinking	.80		
SK3 Writing	.76		
SK22 Idea Evaluation	.73		
SK24 Solution Appraisal	.72		
SK5 Mathematics	.72		
SK21 Idea Generation	.72		
SK17 Problem Identification	.70		
SK41 Judgment and Decision Making	.70		
SK6 Science	.69		
SK10 Monitoring	.65		
SK39 Identification of Downstream Consequences	.65		
SK37 Visioning	.65		
SK40 Identification of Key Causes	.65		
SK38 Systems Perceptions	.62		
SK23 Implementation Planning	.62		
SK42 Systems Evaluation	.62		
SK9 Learning Strategies	.62		
SK4 Speaking	.61		
SK2 Active Listening	.61		
SK29 Programming	.59		
SK25 Operations Analysis	.56		
SK13 Persuasion	.46		
SK15 Instructing	.43		
SK30 Testing	.42		
SK43 Time Management	.41		
SK12 Coordination	.38		
2. Management (31)		26.70%	.993
SK46 Management of Personnel Resources	.84		
SK43 Time Management	.80		
SK44 Management of Financial Resources	.79		

Table A-3 (2 of 3)

O*NET LEVEL: Factor Title and Skills	Factor Loading	% Variance	Cong. Coeff.
SK45 Management of Material Resources	.78		
SK12 Coordination	.75		
SK14 Negotiation	.75		
SK42 Systems Evaluation	.70		
SK23 Implementation	.68		
SK39 Identification of Downstream Consequences	.68		
SK37 Visioning	.67		
SK38 Systems Perceptions	.67		
SK40 Identification of Key Causes	.66		
SK13 Persuasion	.66		
SK41 Judgment and Decision Making	.62		
SK22 Idea Evaluation	.59		
SK24 Solution Appraisal	.59		
SK10 Monitoring	.59		
SK15 Instructing	.58		
SK21 Idea Generation	.58		
SK11 Social Perceptiveness	.58		
SK9 Learning Strategies	.54		
SK4 Speaking	.53		
SK17 Problem Identification	.52		
SK7 Critical Thinking	.49		
SK25 Operations Analysis	.48		
SK2 Active Listening	.47		
SK8 Active Learning	.46		
SK18 Information Gathering	.42		
SK20 Synthesis/Reorganization	.42		
SK3 Writing	.42		
SK16 Service Orientation	.40		
3. Equipment Maintenance and Repair (11)		14.54%	.982
SK35 Troubleshooting	.91		
SK34 Equipment Maintenance	.86		
SK31 Operation Monitoring	.83		
SK36 Repairing	.82		
SK28 Installation	.79		
SK30 Testing	.78		
SK32 Operation and Control	.73		
SK27 Equipment Selection	.64		
SK26 Technical Design	.63		
SK33 Product Inspection	.58		
SK6 Science	.43		

Table A-3 (3 of 3)

O*NET LEVEL: Factor Title and Skills	Factor Loading	% Variance	Cong. Coeff.
4. Service (5)		5.04%	.970
SK16 Service Orientation	.68		
SK11 Social Perceptiveness	.59		
SK2 Active Listening	.49		
SK4 Speaking	.45		
SK15 Instructing	.43		
5. Technical Design (2)		2.55%	-.732
SK26 Technical Design	.47		
SK25 Operations Analysis	.46		

Table A-4 (1 of 3) (Skill Importance) Seven-Factor Solution: Factor Titles, Salient Skills, Percentages of Variance Explained, and Coefficients of Congruence

O*NET LEVEL: Factor Title and Skills		Factor Loading	% Variance	Cong. Coeff.
1.Thinking and Problem-Solving (33)			36.38%	.985
SK22	Idea Evaluation	.88		
SK40	Identification of Key Causes	.87		
SK7	Critical Thinking	.87		
SK37	Visioning	.87		
SK38	Systems Perceptions	.87		
SK39	Identification of Downstream Consequences	.86		
SK24	Solution Appraisal	.86		
SK41	Judgment and Decision Making	.85		
SK21	Idea Generation	.84		
SK8	Active Learning	.84		
SK42	Systems Evaluation	.83		
SK23	Implementation Planning	.78		
SK20	Synthesis/Reorganization	.77		
SK18	Information Gathering	.74		
SK9	Learning Strategies	.74		
SK10	Monitoring	.73		
SK17	Problem Identification	.72		
SK19	Information Organization	.67		
SK43	Time Management	.65		
SK1	Reading Comprehension	.65		
SK13	Persuasion	.60		
SK3	Writing	.60		
SK12	Coordination	.59		
SK14	Negotiation	.57		
SK4	Speaking	.55		
SK46	Management of Personnel Resources	.55		
SK2	Active Listening	.52		
SK15	Instructing	.51		
SK25	Operations Analysis	.50		
SK44	Management of Financial Resources	.44		
SK6	Science	.43		
SK11	Social Perceptiveness	.43		
SK45	Management of Material Resources	.43		

Table A-4 (2 of 3) (Skill Importance) Seven-Factor Solution: Factor Titles, Salient Skills, Percentages of Variance Explained, and Coefficients of Congruence

O*NET LEVEL: Factor Title and Skills	Factor Loading	% Variance	Cong. Coeff.
2. Equipment Maintenance and Repair (10)		12.65%	.990
SK35 Troubleshooting	.91		
SK36 Repairing	.85		
SK34 Equipment Maintenance	.82		
SK28 Installation	.78		
SK30 Testing	.74		
SK27 Equipment Selection	.65		
SK31 Operation Monitoring	.64		
SK26 Technical Design	.59		
SK32 Operation and Control	.49		
SK33 Product Inspection	.41		
3. Service (7)		9.13%	.992
SK16 Service Orientation	.77		
SK11 Social Perceptiveness	.76		
SK4 Speaking	.67		
SK2 Active Listening	.66		
SK15 Instructing	.55		
SK13 Persuasion	.47		
SK12 Coordination	.42		
4. Mathematics and Science (8)		6.73%	.872
SK5 Mathematics	.60		
SK6 Science	.51		
SK1 Reading Comprehension	.50		
SK19 Information Organization	.50		
SK18 Information Gathering	.49		
SK3 Writing	.45		
SK29 Programming	.44		
SK20 Synthesis/Reorganization	.40		
5. Management (6)		6.35%	.922
SK45 Management of Material Resources	.66		
SK44 Management of Financial Resources	.64		
SK46 Management of Personnel Resources	.60		
SK14 Negotiation	.46		
SK43 Time Management	.45		
SK12 Coordination	.43		

Table A-4 (3 of 3)

O*NET LEVEL: Factor Title and Skills	Factor Loading	% Variance	Cong. Coeff.
6. Equipment Operation and Monitoring (2)		2.77%	.964
SK31 Operation Monitoring	.64		
SK32 Operation and Control	.63		
7. Technical Design (3)			
SK27 Equipment Selection	.43	2.75%	.882
SK26 Technical Design	.42		
SK25 Operations Analysis	.39		

Table A-5 (1 of 2) (Generalized Work Activities Level) Six-Factor Solution: Factor Titles, Salient GWAs, Percentages of Variance Explained, and Coefficients of Congruence

O*NET LEVEL: Factor Title and GWAs	Factor Loading	% Variance	Cong. Coeff.
1.Analyzing and Problem-Solving (28)		33.56%	.999
GWA9 Analyzing Data or Information	.89		
GWA8 Processing Information	.89		
GWA12 Updating and Using Job-relevant Knowledge	.87		
GWA2 Identifying Objects, Actions, and Events	.86		
GWA1 Getting Information Needed to Do Job	.86		
GWA25 Documenting/Recording Information	.83		
GWA10 Making Decisions and Solving Problems	.83		
GWA26 Interpreting the Meaning of Information for Others	.82		
GWA7 Evaluating Information for Compliance to Standards	.81		
GWA6 Judging the Qualities of Objects, Services, or Persons	.77		
GWA19 Interacting with Computers	.77		
GWA39 Providing Consultation and Advice to Others	.72		
GWA22 Implementing Ideas, Programs, Systems or Products	.71		
GWA27 Communicating with Supervisors, Peers, or Subordinates	.70		
GWA3 Monitoring Processes, Materials, or Surroundings	.69		
GWA5 Estimating the Characteristics of Materials, Products Events or Information	.68		
GWA13 Developing Objectives and Strategies	.64		
GWA15 Organizing, Planning, and Prioritizing Work	.64		
GWA11 Thinking Creatively	.57		
GWA28 Communicating with Persons Outside the Organizations	.54		
GWA40 Performing Administrative Activities	.53		
GWA36 Teaching Others	.46		
GWA21 Drafting, Laying-out, and Specifying Technical Devices, Parts, and Equipment	.42		
GWA14 Scheduling Work and Activities	.41		
GWA29 Establishing and Maintaining Interpersonal Relationships	.40		
GWA34 Coordinating the Work and Activities of Others	.39		
GWA17 Handling and Moving Objects	-.43		
GWA16 Performing General Physical Activities	-.46		
2. Managing Others (18)			
GWA37 Guiding, Directing and Motivating Subordinates	.88	21.73%	.998
GWA35 Developing and Building Teams	.85		
GWA41 Staffing Organizational Units	.83		
GWA34 Coordinating the Work and Activities of Others	.81		

Table A-5 (2 of 2)

O*NET LEVEL: Factor Title and GWAs	Factor Loading	% Variance	Cong. Coeff.
GWA14 Scheduling Work and Activities	.77		
GWA38 Coaching and Developing Others	.75		
GWA42 Monitoring and Controlling Resources	.74		
GWA32 Resolving Conflicts and Negotiating with Others	.66		
GWA40 Performing Administrative Activities	.63		
GWA13 Developing Objectives and Strategies	.56		
GWA15 Organizing, Planning and Prioritizing Work	.56		
GWA36 Teaching Others	.55		
GWA27 Communicating with Supervisors, Peers, or Subordinates	.53		
GWA29 Establishing and Maintaining Interpersonal Relationships	.53		
GWA31 Selling or Influencing Others	.47		
GWA39 Providing Consultation and Advice to Others	.47		
GWA5 Estimating the Characteristics of Materials, Products, Events or Information	.41		
GWA10 Making Decisions and Solving Problems	.40		
3. Interacting with Others (6)		9.24%	.995
GWA33 Performing for or Working Directly with the Public	.80		
GWA30 Assisting and Caring for Others	.68		
GWA29 Establishing and Maintaining Interpersonal Relationships	.63		
GWA28 Communicating with Persons Outside the Organizations	.62		
GWA31 Selling or Influencing Others	.56		
GWA32 Resolving Conflicts and Negotiating with Others	.46		
4. Repairing and Maintaining Equipment (8)		8.13%	.991
GWA23 Repairing and Maintaining Mechanical Equipment	.77		
GWA4 Inspecting Equipment, Structures or Materials	.75		
GWA18 Controlling Machines and Processes	.68		
GWA24 Repairing and Maintaining Electronic Equipment	.58		
GWA16 Performing General Physical Activities	.53		
GWA17 Handling and Moving Objects	.51		
GWA3 Monitoring Processes, Materials or Surroundings	.43		
GWA20 Operating Vehicles, Mechanized Devices or Equipment	.39		
5. Drafting and Designing (3)		3.02%	.960
GWA21 Drafting, Laying-out, and Specifying Technical Devices, Parts and Equipment	.53		
GWA11 Thinking Creatively	.50		
GWA22 Implementing Ideas, Programs, Systems or Products	.39		
6. Teaching Others (1)		1.95%	.966
GWA36 Teaching Others	.39		

Table A-6 (1 of 2) (Generalized Work Activities Importance) Seven-Factor Solution: Factor Titles, Salient GWAs, and Percentages of Variance Explained

O*NET IMPORTANCE: Factor Title and GWAs	Factor Loading	% Variance
1. Analyzing and Problem-Solving (20)		20.24
08. Processing Information	.84	
09. Analyzing Data or Information	.79	
02. Identifying Objects, Actions, and Events	.77	
25. Documenting/Recording Information	.76	
01. Getting Information Needed to Do Job	.74	
12. Updating and Using Job-Relevant Knowledge	.66	
26. Interpreting the Meaning of Information for Others	.65	
07. Evaluating Information for Compliance to Standards	.64	
10. Making Decisions and Solving Problems	.63	
19. Interacting with Computers	.63	
40. Performing Administrative Activities	.60	
39. Providing Consultation and Advice to Others	.57	
06. Judging the Qualities of Objects, Services, or Persons	.52	
27. Communicating with Supervisors, Peers, or Subordinates	.51	
15. Organizing, Planning, and Prioritizing Work	.43	
13. Developing Objectives and Strategies	.43	
28. Communicating with Persons Outside the Organizations	.39*	
05. Estimating the Characteristics of Materials, Products, Events or Information	.33*	
16. Performing General Physical Activities	-.55	
17. Handling and Moving Objects	-.51	
2. Managing Others (16)		19.98
37. Guiding, Directing and Motivating Subordinates	.91	
35. Developing and Building Teams	.86	
34. Coordinating the Work and Activities of Others	.85	
41. Staffing Organizational Units	.78	
38. Coaching and Developing Others	.77	
14. Scheduling Work and Activities	.75	
36. Teaching Others	.61	
42. Monitoring and Controlling	.63	
13. Developing Objectives and Strategies	.62	
15. Organizing, Planning, and Prioritizing Work	.58	
27. Communicating with Supervisors, Peers, or Subordinates	.57	
32. Resolving Conflicts and Negotiating with Others	.56	
40. Performing Administrative Activities	.49	
29. Establishing and Maintaining Interpersonal Relationships	.49	
10. Making Decisions and Solving Problems	.43	
39. Providing Consultation and Advice to Others	.42	

Table A-6 (2 of 2)

O*NET IMPORTANCE: Factor Title and GWAs	Factor Loading	% Variance
3. Interacting with Others (8)		11.38
33. Performing for or Working Directly with the Public	.83	
28. Communicating with Persons Outside the Organizations	.74	
29. Establishing and Maintaining Interpersonal Relationships	.72	
30. Assisting and Caring for Others	.68	
31. Selling or Influencing Others	.59	
32. Resolving Conflicts and Negotiating with Others	.53	
26. Interpreting the Meaning of Information for Others	.47	
36. Teaching Others	.37	
4. Repairing and Maintaining Equipment (7)		7.88
04. Inspecting Equipment, Structures, or Materials	.76	
23. Repairing and Maintaining Mechanical Equipment	.70	
18. Controlling Machines and Processes	.60	
24. Repairing and Maintaining Electronic Equipment	.54	
03. Monitoring Processes, Materials, or Surroundings	.58	
17. Handling and Moving Objects	.50	
16. Performing General Physical Activities	.49	
5. Drafting and Designing (5)		7.12
22. Implementing Ideas, Programs, Systems or Products	.66	
21. Drafting, Laying-out, Specifying Technical Devices, Parts, and Equipment	.65	
11. Thinking Creatively	.64	
15. Organizing, Planning, and Prioritizing Work	.42	
05. Estimating the Characteristics of Materials, Products, Events	.41	
6. Teaching/Coaching (2)		2.29
36. Teaching Others	.45	
38. Coaching and Developing Others	.36	
7. Using Computers (2)		1.98
10. Making Decisions and Problem-Solving	.30	
19. Interacting with Computers	-.36	

Appendix B.

Factor Analyses of O*NET Concrete & Abstract Variables

Table B-1 (1 of 3) (Abstract Level) Five-Factor Solution: Factor Titles, Salient Abstract Dimensions, Percentages of Variance Explained, and Coefficients of Congruence

ABSTRACT LEVEL: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
1. Analysis and Problem-Solving (31)		29.57%	.999
GWA12 Updating and Using Job-relevant Knowledge	.84		
GWA9 Analyzing Data or Information	.84		
GWA2 Identifying Objects, Actions, and Events	.80		
GWA1 Getting Information Needed to Do Job	.78		
GWA10 Making Decisions and Solving Problems	.77		
SK6 Science	.76		
GWA26 Interpreting the Meaning of Information for Others	.73		
SK18 Information Gathering	.73		
SK8 Active Learning	.2		
SK5 Mathematics	.72		
SK20 Synthesis/Reorganization	.70		
SK19 Information Gathering	.70		
SK7 Critical Thinking	.70		
GWA3 Monitoring Processes, Materials or Surroundings	.68		
SK17 Problem Identification	.64		
GWA39 Providing Consultation and Advice to Others	.64		
SK22 Idea Evaluation	.63		
SK24 Solution Judgment	.62		
SK41 Judgment and Decision Making	.60		
GWA13 Developing Objectives and Strategies	.59		
SK39 Identification of Downstream Consequences	.58		
GWA15 Organizing, Planning, and Prioritizing Work	.58		
GWA11 Thinking Creatively	.58		
SK42 Systems Evaluation	.56		
SK37 Visioning	.56		
SK38 Systems Perceptions	.55		
SK40 Identification of Key Causes	.55		
SK10 Monitoring	.53		
SK9 Learning Strategies	.48		
SK2 Active Learning	.44		
GWA36 Teaching Others	.39		
2. Management and Development (18)		18.10%	.998
GWA37 Guiding, Directing and Motivating Subordinates	.86		
GWA35 Developing and Building Teams	.81		
GWA34 Coordinating the Work and Activities of Others	.80		

Table B-1 (2 of 3)

ABSTRACT LEVEL: Factor Title and Variables		Factor Loading	% Variance	Cong. Coeff.
SK46	Management of Personnel Resources	.76		
GWA38	Coaching and Developing Others	.74		
GWA42	Monitoring and Controlling Resources	.65		
KN1	Administration and Management	.62		
GWA36	Teaching Others	.57		
SK43	Time Management	.56		
SK12	Coordination	.53		
SK15	Instructing	.52		
GWA32	Resolving Conflicts and Negotiating with Others	.51		
GWA13	Developing Objectives and Strategies	.49		
GWA15	Organizing, Planning and Prioritizing Work	.48		
GWA29	Establishing and Maintaining Interpersonal Relationships	.43		
GWA39	Providing Consultation and Advice to Others	.41		
SK14	Negotiation	.39		
SK42	Systems Evaluation	.38		
3. Visioning and Evaluation (25)			17.03%	.996
SK37	Visioning	.65		
SK40	Identification of Key Causes	.64		
SK38	Systems Perceptions	.64		
SK39	Identification of Downstream Consequences	.64		
SK42	Systems Evaluation	.62		
SK24	Solution Appraisal	.60		
SK41	Judgment and Decision Making	.60		
SK43	Time Management	.60		
SK22	Idea Evaluation	.56		
SK10	Monitoring	.55		
SK14	Negotiation	.54		
SK13	Persuasion	.54		
SK12	Coordination	.53		
SK7	Critical Thinking	.52		
SK9	Learning Strategies	.52		
SK17	Problem Identification	.50		
SK8	Active Learning	.50		
SK20	Synthesis/Reorganization	.47		
SK46	Management of Personnel Resources	.46		
SK18	Information Gathering	.46		
SK2	Active Listening	.45		
SK11	Social Perceptiveness	.45		
KN1	Administration and Management	.44		
SK19	Information Organization	.43		
SK15	Instructing	.39		

Table B-1 (3 of 3)

ABSTRACT LEVEL: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
4. Sales and Marketing (11)		9.69%	.994
GWA31 Selling or Influencing Others	.70		
GWA32 Resolving Conflicts and Negotiating with Others	.65		
GWA29 Establishing and Maintaining Interpersonal Relationships	.57		
SK14 Negotiation	.55		
SK13 Persuasion	.51		
SK11 Social Perceptiveness	.46		
GWA42 Monitoring and Controlling Resources	.45		
SK2 Active Listening	.44		
GWA39 Providing Consultation and Advice to Others	.43		
GWA15 Organizing, Planning	.41		
GWA13 Developing Objectives and Strategies	.39		
5. Service (9)		9.13%	.996
GWA30 Assisting and Caring for Others	.78		
KN22 Therapy and Counseling	.77		
SK11 Social Perceptiveness	.60		
GWA36 Teaching Others	.55		
SK15 Instructing	.54		
GWA29 Establishing and Maintaining Interpersonal Relationships	.49		
SK2 Active Listening	.46		
GWA38 Coaching and Developing Others	.46		
SK9 Learning Strategies	.46		

Table B-2 (1 of 3) (Abstract Importance) Seven-Factor Solution: Factor Titles, Salient Abstract Dimensions, Percentages of Variance Explained, and Coefficients of Congruence

ABSTRACT IMPORTANCE: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
1. Visioning and Evaluation (32)		27.98%	.998
SK37 Visioning	.83		
SK24 Solution Appraisal	.83		
SK40 Identification of Key Causes	.83		
SK39 Identification of Downstream Consequences	.82		
SK38 Systems Perceptions	.82		
SK22 Idea Evaluation	.81		
SK42 Systems Evaluation	.80		
SK7 Critical Thinking	.79		
SK41 Judgment and Decision Making	.78		
SK8 Active Learning	.77		
SK17 Problem Identification	.71		
SK18 Information Gathering	.70		
SK10 Monitoring	.70		
SK20 Synthesis/Reorganization	.70		
SK9 Learning Strategies	.69		
SK19 Information Organization	.67		
SK43 Time Management	.61		
SK13 Persuasion	.55		
SK12 Coordination	.53		
SK14 Negotiation	.52		
SK5 Mathematics	.47		
SK2 Active Listening	.47		
SK6 Science	.46		
SK46 Management of Personnel Resources	.45		
GWA10 Making Decisions and Solving Problems	.45		
SK15 Instructing	.43		
GWA1 Getting Information Needed to Do Job	.43		
GWA9 Analyzing Data or Information	.42		
KN1 Administration and Management	.40		
GWA39 Providing Consultation and Advice to Others	.39		
GWA12 Updating and Using Job-relevant Knowledge	.39		
GWA13 Developing Objectives and Strategies	.38		
2. Management and Development (16)		17.28%	.994
GWA37 Guiding, Directing and Motivating Subordinates	.90		
GWA34 Coordinating the Work and Activities of Others	.84		

Table B-2 (2 of 3)

ABSTRACT IMPORTANCE: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
GWA35 Developing and Building Teams	.83		
SK46 Management of Personnel Resources	.80		
KN1 Administration and Management	.72		
GWA38 Coaching and Developing Others	.71		
GWA42 Monitoring and Controlling Resources	.63		
GWA36 Teaching Others	.58		
GWA13 Developing Objectives and Strategies	.56		
GWA15 Organizing, Planning and Prioritizing Work	.55		
SK12 Coordination	.53		
GWA32 Resolving Conflicts and Negotiating with Others	.52		
SK43 Time Management	.52		
SK15 Instructing	.47		
GWA29 Establishing and Maintaining Interpersonal Relationships	.45		
GWA10 Making Decisions and Solving Problems	.39		
3. Analysis and Problem-Solving (15)		11.62%	.990
GWA9 Analyzing Data or Information	.74		
GWA2 Identifying Objects, Actions and Events	.68		
GWA1 Getting Information Need to Do Job	.65		
GWA12 Updating and Using Job-relevant Knowledge	.65		
GWA26 Interpreting the Meaning of Information for Others	.60		
GWA10 Making Decisions and Solving Problems	.54		
SK18 Information Gathering	.54		
GWA39 Providing Consultation and Advice to Others	.51		
SK19 Information Organization	.46		
SK6 Science	.46		
SK20 Synthesis/Reorganization	.44		
SK5 Mathematics	.43		
SK7 Critical Thinking	.41		
SK8 Active Learning	.40		
GWA15 Organizing, Planning and Prioritizing Work	.39		
4. Service (10)		9.19%	.993
GWA30 Assisting and Caring for Others	.79		
KN22 Therapy and Counseling	.76		
SK11 Social Perceptiveness	.62		
SK15 Instructing	.59		
GWA36 Teaching Others	.58		

Table B-2 (3 of 3)

ABSTRACT IMPORTANCE: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
GWA29 Establishing and Maintaining Interpersonal Relationships	.56		
SK2 Active Listening	.50		
GWA38 Coaching and Developing Others	.50		
SK9 Learning Strategies	.46		
GWA26 Interpreting the Meaning of Information for Others	.43		
5. Sales and Marketing (8)		7.67%	.981
GWA31 Selling or Influencing Ideas	.71		
GWA32 Resolving Conflicts and Negotiating with Others	.63		
SK14 Negotiation	.61		
SK13 Persuasion	.58		
GWA29 Establishing and Maintaining Interpersonal Relationships	.50		
SK11 Social Perceptiveness	.49		
SK2 Active Listening	.38		
GWA42 Monitoring and Controlling Resources	.38		
6. Thinking Creatively (1)		2.60%	.535
GWA11 Thinking Creatively	.59		
7. Monitoring Processes		2.51%	.896
GWA3 Monitoring Processes, Materials or Surroundings	.63		

Table B-3 (1 of 3) (Concrete Level) Eight-Factor Solution: Factor Titles, Salient Concrete Dimensions, Percentages of Variance Explained, and Coefficients of Congruence

CONCRETE LEVEL: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
1. Equipment Maintenance and Repair (16)		17.76%	.994
SK34 Equipment Maintenance	.89		
SK35 Troubleshooting	.88		
SK36 Repairing	.84		
SK31 Operation Monitoring	.82		
GWA23 Repairing and Maintaining Mechanical Equipment	.80		
KN13 Mechanical	.78		
SK28 Installation	.75		
SK32 Operation and Control	.74		
GWA4 Inspecting Equipment, Structures or Materials	.71		
SK30 Testing	.70		
GWA24 Repairing and Maintaining Electronic Equipment	.69		
GWA18 Controlling Machines and Processes	.64		
KN10 Engineering and Technology	.59		
SK27 Equipment Selection	.51		
SK33 Product Inspection	.50		
GWA17 Handling and Moving Objects	.41		
2. Management (19)		16.45%	.991
GWA41 Staffing Organizational Units	.85		
GWA14 Scheduling Work and Activities	.84		
SK44 Management of Financial Resources	.82		
KN6 Personnel and Human Resources	.81		
GWA40 Performing Administrative Activities	.77		
SK45 Management of Material Resources	.76		
GWA27 Communicating with Supervisors, Peers or Subordinates	.68		
KN3 Economics and Accounting	.67		
SK4 Speaking	.62		
GWA28 Communicating with Persons Outside the Organizations	.59		
GWA5 Estimating the Characteristics of Materials, Products Events or Information	.58		
KN23 Education and Training	.57		
SK3 Writing	.56		
GWA22 Implementing, Ideas, Programs, Systems or Products	.54		
KN4 Sales and Marketing	.49		
GWA25 Documenting/Recording Information	.48		
KN32 Communications and Media	.42		
KN14 Mathematics	.40		
GWA17 Handling and Moving Objects	-.41		

Table B-3 (2 of 3)

CONCRETE LEVEL: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
3. Information Processing and Communications (17)		13.12%	.990
GWA19 Interacting with Computers	.81		
KN9 Computers and Electronics	.80		
GWA25 Documenting/Recording Information	.71		
SK3 Writing	.67		
SK29 Programming	.63		
KN14 Mathematics	.58		
GWA27 Communicating with Supervisors, Peers or Subordinates	.56		
KN2 Clerical	.53		
SK4 Speaking	.52		
KN32 Communications and Media	.51		
KN31 Telecommunications	.47		
GWA28 Communicating with Persons Outside the Organizations	.46		
GWA40 Performing Administrative Activities	.44		
GWA22 Implementing Ideas, Programs, Systems or Products	.41		
GWA5 Estimating the Characteristics of Materials, Products, Events or Information	.40		
GWA17 Handling and Moving Objects	-.49		
GWA16 Performing General Physical Activities	-.61		
4. Design and Drafting (6)		7.35%	.988
KN11 Design	.82		
GWA21 Drafting, Laying-out and Specifying Technical Devices, Parts and Equipment	.74		
KN12 Building and Construction	.62		
KN10 Engineering and Technology	.61		
SK27 Equipment Selection	.52		
SK33 Product Inspection	.42		
5. Biology		5.28%	.981
KN17 Biology	.87		
KN21 Medicine and Dentistry	.74		
KN16 Chemistry	.70		
6. Transportation and Safety		4.96%	.984
KN33 Transportation	.81		
GWA20 Operating Vehicles, Mechanized Devices or Equipment	.71		
KN20 Geography	.67		
KN29 Public Safety and Security	.60		

Table B-3 (3 of 3)

CONCRETE LEVEL: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
7. Customer Service		2.71%	.864
KN5 Customer and Personal Service	.55		
KN4 Sales and Marketing	.42		
8. Production and Processing		2.34%	.878
KN7 Production	.58		

Table B-4 (1 of 2) (Concrete Importance) Nine-Factor Solution: Factor Titles, Salient Concrete Dimensions, Percentages of Variance Explained, and Coefficients of Congruence

CONCRETE IMPORTANCE: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
1. Equipment Maintenance and Repair		15.34%	.995
SK35 Troubleshooting	.90		
SK36 Repairing	.87		
SK34 Equipment Maintenance	.84		
GWA23 Repairing and Maintaining Mechanical Equipment	.79		
SK28 Installation	.74		
KN13 Mechanical	.73		
SK30 Testing	.72		
GWA24 Repairing and Maintaining Electronic Equipment	.71		
GWA4 Inspecting Equipment, Structures or Materials	.68		
SK31 Operation Monitoring	.64		
KN10 Engineering and Technology	.56		
SK27 Equipment Selection	.54		
SK32 Operation and Control	.48		
GWA18 Controlling Machines and Processes	.42		
2. Management		12.33%	.996
GWA41 Staffing Organizational Units	.82		
KN6 Personnel and Human Resources	.81		
GWA14 Scheduling Work and Activities	.79		
SK44 Management of Financial Resources	.74		
SK45 Management of Material Resources	.71		
GWA27 Communicating with Supervisors, Peers, or Subordinates	.60		
GWA40 Performing Administrative Activities	.55		
SK4 Speaking	.54		
KN23 Education and Training	.53		
KN3 Economics and Accounting	.52		
GWA5 Estimating the Characteristics of Materials, Products, Events or Information	.50		
GWA28 Communicating with Persons Outside the Organizations	.45		
SK3 Writing	.43		
GWA22 Implementing Ideas, Programs, Systems or Products	.41		
KN4 Sales and Marketing	.40		
GWA17 Handling and Moving Objects	-.44		
3. Information Processing and Communications		11.98%	.986
KN9 Computers and Electronics	.82		
GWA19 Interacting with Computers	.80		
GWA25 Documenting/Recording Information	.69		
SK3 Writing	.67		
KN2 Clerical	.61		
SK29 Programming	.53		
GWA40 Performance Administration Activities	.52		

Table B-4 (2 of 2)

CONCRETE IMPORTANCE: Factor Title and Variables	Factor Loading	% Variance	Cong. Coeff.
KN14 Mathematics	.52		
KN32 Communications and Media	.51		
KN31 Telecommunications	.51		
GWA27 Communicating with Supervisors, Peers or Subordinates	.47		
SK4 Speaking	.47		
GWA28 Communicating with Persons Outside the Organizations	.40		
KN12 Building and Construction	-.40		
GWA17 Handling and Moving Objects	-.43		
GWA16 Performing General Physical Activities	-.62		
4. Design and Drafting		6.42%	.990
KN11 Design	.82		
GWA21 Drafting, Laying-out and Specifying Technical Devices, Parts and Equipment	.79		
KN10 Engineering and Technology	.55		
KN12 Building and Construction	.50		
SK27 Equipment Selection	.47		
GWA22 Implementing Ideas, Programs, Systems or Products	.40		
5. Transportation and Safety		4.94%	.990
KN33 Transportation	.80		
GWA20 Operating Vehicles, Mechanized Devices or Equipment	.70		
KN20 Geography	.67		
KN29 Public Safety	.58		
6. Equipment/Processes Operation and Control		4.86%	.975
SK32 Operation and Control	.65		
GWA18 Controlling Machines and Processes	.63		
KN7 Production and Processing	.52		
SK31 Operation Monitoring	.52		
GWA17 Handling and Moving Objects	.42		
GWA28 Communicating with Persons Outside the Organizations	-.41		
7. Biology		4.50%	.985
KN17 Biology	.83		
KN21 Medicine and Dentistry	.67		
KN16 Chemistry	.67		
8. Customer Service		2.81%	.924
KN5 Customer and Personal Service	.61		
9. Economics and Accounting		2.56%	.829
KN3 Economics and Accounting	.51		
KN14 Mathematics	.43		