Fleishman's Taxonomy of Human Abilities

Ability Taxonomy: Introduction

At I/O Solutions, we utilize research to build selection tools that are effective and valid. Part of this effort is to use an ability taxonomy in developing our cognitive ability exams. Instead of solely relying on subject-matter experts (SMEs) to produce a list of abilities for a specific job, I/O Solutions uses an ability taxonomy that has been researched for the last 60 years.

An ability taxonomy is based on the premise that there is a finite set of human abilities that can be used in the performance of a task. The taxonomy includes both cognitive and motor abilities. Various ability taxonomies have been proposed in the past few decades. For example, Thurstone (1938[i]) viewed intelligence as composed of a small set of primary mental abilities that include verbal comprehension, numerical reasoning, word fluency and memory. As another example, Guilford (1956[2]; 1959[3]) suggested a model of intellectual abilities that he named the "Structure of the Intellect Model" to describe tasks using an information-processing model. Additionally, in an attempt to build upon previous ability sets, Fleishman and his colleagues have conducted research to identify a basic set of human abilities that might be used to characterize the demands of most performance situations, including work performance.

Development of Human Abilities Taxonomy

Fleishman conducted research to understand the feasibility and usefulness of ability constructs in the analysis of tasks and jobs. In the first step, Fleishman conducted a comprehensive review of the literature and determined the cognitive, perceptual, psychomotor and physical abilities previously identified in research. Fleishman then refined these abilities to improve their utility in describing tasks. Next, these abilities were merged into a single list and reviewed by psychologists who provided comments on their importance. Based on these comments, attempts were made to describe more carefully the extent and limit of the abilities.

Finally, after many years of research, Fleishman developed his own ability taxonomy that has been widely recognized and used for the last few decades.

Fleishman's Taxonomy

Fleishman has identified, described and isolated a comprehensive set of cognitive abilities that might be thought of as the cognitive resources available to an individual in carrying out any task. Fleishman developed 52 human abilities that range from verbal comprehension to selective attention (Fleishman et al., 1984[4]). In the Ability Requirements Approach, tasks are to be described, contrasted and compared in terms of the abilities that a given task requires of the individual performer. Tasks requiring similar abilities would be placed within the same category or would be said to be similar. The existence of such a set of clearly defined cognitive abilities permits us to develop examinations that will tap those abilities important for carrying out essential job tasks.

The table below shows Fleishman's 52 human abilities and their definitions.

Ability	Definition
Oral comprehension	Ability to understand spoken English words and sentences.
Written comprehension	Ability to understand written sentences and paragraphs.
Oral expression	Ability to use English words or sentences in speaking so others will understand.
Written expression	Ability to use English words or sentences in writing so others will understand.
Fluency of ideas	Ability to produce a number of ideas about a given topic.
Originality	Ability to produce unusual or clever ideas about a given topic or situation. It is the ability to invent creative solutions to problems or to develop new procedures to situations in which standard operating procedures do not apply.
Memorization	Ability to remember information, such as words, numbers, pictures, and procedures. Pieces of information can be remembered by themselves or with other pieces of information.
Problem sensitivity	Ability to tell when something is wrong or is likely to go wrong. It includes being able to identify the whole problem as well as the elements of the problem.
Mathematical reasoning	Ability to understand and organize a problem and then to select a mathematical method or formula to solve the problem. It encompasses reasoning through mathematical problems to determine appropriate operations that can be performed to solve problems. It also includes the understanding or structuring of mathematical problems. The actual manipulation of numbers is not included in this ability.
Number facility	Involves the degree to which adding, subtracting, multiplying, and dividing can be done quickly and correctly. These can be steps in other operations, such as finding percentages and taking square roots.
Deductive reasoning	Ability to apply general rules to specific problems to come up with logical answers. It involves deciding if an answer make sense.
Inductive reasoning	Ability to combine separate pieces of information, or specific answers to problems, to form general rules or conclusions.
Information gathering	Ability to follow correctly a rule or set of rules to arrange things or actions in a certain order. The rule or sets of rules used must be given. The things or actions to be put in order can include numbers, letters, words, pictures, procedures, sentences, and mathematical or logical operations.
Category flexibility	Ability to produce many rules so that each rule tells how to group a set of things in a different way. Each different group must contain at least two things from the original set of things.
Speed of closure	Involves the degree to which different pieces of information can be combined and organized into one meaningful pattern quickly. It is not known beforehand what the pattern will be. The material may be visual or auditory.
Flexibility of closure	Ability to identify or detect a known pattern (such as a figure, word, or object) that is hidden in other material. The task is to pick out the disguised pattern from the background material.
Spatial orientation	Ability to tell where you are in relation to the location of some object or to tell where the object is in relation to you.
Visualization	Ability to imagine how something will look when it is moved around or when its parts are moved or rearranged. It requires the forming of mental images of how patterns or objects would look after certain changes, such as unfolding or rotation. One has to predict how an object, set of objects or pattern will appear after the changes are carried out.

Ability	Definition
Perceptual speed	Involves the degree to which one can compare letters, numbers, objects, pictures or patterns, quickly and accurately. The things to be compared may be presented at the same time or one after the other. This ability also includes comparing a presented object with a remembered object.
Control precision	Ability to move controls of a machine or vehicle. This involves the degree to which these controls can be moved quickly and repeatedly to exact positions.
Multiple coordination	Ability to coordinate movements of two or more limbs (for example, two arms, two legs or one leg and one arm), such as in moving equipment controls. Two or more limbs are in motion while the individual is sitting, standing or lying down.
Response orientation	Ability to choose between two or more movements quickly and accurately when two or more different signals (lights, sounds, pictures) are given. The ability is concerned with the speed with which the right response can be started with the hand, foot or other parts of the body.
Rate control	Ability to adjust an equipment control in response to changes in the speed and/or directions of a continuously moving object or scene. The ability involves timing these adjustments in anticipating these changes. This ability does not extend to situations in which both the speed and direction of the object are perfectly predictable.
Reaction time	Ability to give one fast response to one signal (sound, light, picture) when it appears. This ability is concerned with the speed with which the movement can be started with the hand, foot or other parts of the body.
Arm-hand steadiness	Ability to keep the hand or arm steady. It includes steadiness while making an arm movement as well as while holding the arm and hand in one position. This ability does not involve strength or speed.
Manual dexterity	Ability to make skillful coordinated movements of one hand, a hand together with its arm, or two hands to grasp, place, move or assemble objects, such as hand tools or blocks. This ability involves the degree to which these arm-hand movements can be carried out quickly. It does not involve moving machine or equipment controls, such as levers.
Finger dexterity	Ability to make skillful coordinated movements of the fingers of one or both hands and to grasp, place or move small objects. This ability involves the degree to which these finger movements can be carried out quickly.
Wrist-finger speed	Ability to make fast, simple repeated movements of the fingers, hands and wrists. It involves little, if any, accuracy or eye-hand coordination.
Speed of limb movement	Involves the speed with which a single movement of the arms or legs can be made. This ability does not include accuracy, careful control or coordination of movement.
Selective attention	Ability to concentrate on a task one is doing. This ability involves concentrating while performing a boring task and not being distracted.
Time sharing	Ability to shift back and forth between two or more sources of information.
Static strength	Ability to use muscle force in order to lift, push, pull or carry objects. It is the maximum force that one can exert for a brief period of time.
Explosive strength	Ability to use short bursts of muscle force to propel oneself or an object. It requires gathering energy for bursts of muscle effort over a very short time period.

Ability	Definition
Dynamic strength	Ability of the muscles to exert force repeatedly or continuously over a long time period. This is the ability to support, hold up or move the body's own weight and/or objects repeatedly over time. It represents muscular endurance and emphasizes the resistance of the muscles to fatigue.
Trunk strength	Involves the degree to which one's stomach and lower back muscles can support part of the body repeatedly or continuously over time. The ability involves the degree to which these trunk muscles do not fatigue when they are put under such repeated or continuous strain.
Extent flexibility	Ability to bend, stretch, twist, or reach out with the body, arms or legs.
Dynamic flexibility	Ability to bend, stretch, twist, or reach out with the body, arms and/or legs, both quickly and repeatedly.
Gross body coordination	Ability to coordinate the movement of the arms, legs and torso together in activities in which the whole body is in motion.
Gross body equilibrium	Ability to keep or regain one's body balance or stay upright when in an unstable position. This ability includes maintaining one's balance when changing direction while moving or standing motionlessly.
Stamina	Ability of the lungs and circulatory systems of the body to perform efficiently over long time periods. This is the ability to exert oneself physically without getting out of breath.
Near vision	Capacity to see close environmental surroundings.
Far vision	Capacity to see distant environmental surroundings.
Visual color discrimination	Capacity to match or discriminate between colors. This capacity also includes detecting differences in color purity (saturation) and brightness (brilliance).
Night vision	Ability to see under low light conditions.
Peripheral vision	Ability to perceive objects or movements towards the edges of the visual field.
Depth perception	Ability to distinguish which of several objects is more distant from or nearer to the observer or to judge the distance of an object from the observer.

Uses of Human Abilities Taxonomy

A set taxonomy of human abilities is preferable to developing a unique set of ability labels in job analysis. Often, ability labels developed in the context of a job-analysis project are ill-defined and confusing to SMEs who must evaluate their importance. Typically, a group of SMEs will be asked to provide labels for the knowledge, skills and abilities necessary to complete certain tasks. Since these SMEs are unfamiliar with the concept of abilities and have little appreciation for which abilities have been isolated by research, they tend to choose labels that are long-winded or that vary widely in specificity, redundancy and definition. As an example of a common mistake, an SME considering the task of breaking down a door might state that this behavior (breaking down a door) requires "door-breaking ability," or perhaps "the knowledge of where and how to break down a door."

As an example of differences in levels of detail and redundancy, one SME considering the task of directing the efforts of officers at a crime scene might suggest that the following abilities are necessary: ability to work under stress; ability to be heard in noisy conditions; ability to arrange events in proper sequence; ability to plan for unexpected emergencies. A second SME considering the same task might propose the following ability set: ability to complete several tasks at once; ability to communicate; ability to sense when a situation is getting out of control; and human relations ability. As can be seen by comparing these two lists, there are widely differing levels of detail both between and within the SMEs' choices. In addition, although different words are used, several of the "abilities" would seem to be similar. Finally, if one were to examine a textbook listing recognized human abilities, few of these "abilities" would be listed. The fact is that this

method of abilities analysis may lead to confusion and subjectivity in the designation of requisite abilities. As a result, the application of an ability set that had already been identified by independent research and is generally accepted by experts in human-abilities analysis may be a good option for job analysis.

In various job analysis projects, it is often useful to ask SMEs to use the Fleishman taxonomy to provide estimates of the importance of abilities associated with various tasks. As discussed above, use of a single, clearly defined taxonomy or ability list is preferable to asking SMEs to use their own words to describe requisite abilities. In addition, using an exhaustive checklist of abilities guards against the possibility that one or more important abilities might be overlooked.

Conclusion

I/O Solutions does extensive research to create the most accurate job analysis possible for a position. This includes the use of an ability taxonomy to reduce SMEs' confusion and inaccuracy in developing abilities during a job analysis. SMEs still make the decision as to which ability is needed and the importance of that ability for the position; however, instead of developing a list of abilities, they are provided with an already developed comprehensive list of abilities. Fleishman's ability taxonomy is used in the development of several of our tests, such as the National Firefighter Selection Inventory, the National Criminal Justice Officer Selection Inventory, the Criminal Justice Basic Abilities Test and the National Basic Abilities Test.

References

[1] Thurstone, L.L. (1938). *Primary mental abilities*. Chicago: University of Chicago Press.

[2] Guilford, J.P. (1956). "The structure of intellect." *Psychological Bulletin*, 53, 267-293.

[3] Guilford, J.P. (1959). "Three faces of intellect." *American Psychologist*, 14, 469-479.

[4] Fleishman, E.A., Quaintance, M.K. and Broedling, L.A. (1984). *Taxonomies of Human Performance: The description of human tasks*. Orlando, FL: Academic Press, Inc.