ABSTRACT - Introduction to Utilizing the U.S. Department of Labor's Occupational Information Network (O*NET) taxonomy to provide on-target curriculum based on a revolutionary job analysis practice.

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The explosive growth of the Internet along with an increasing focus on globalization has escalated three major business problems to critical status: how to build and maintain a descriptive workforce database in an culture that is experiencing rapid skill & knowledge obsolescence; how to find and extract relevant workforce development knowledge from multiple, changing sources; and how to format and present that knowledge so that business, education, and government executives can easily leverage it to shorten problem solving and concept building cycle times. In order to address these issues the United States Department of Labor has developed the Occupational Information Network (O*NET) as an online replacement for the *Dictionary of Occupational Titles*.

The purpose of the paper is to introduce business professors and professionals to the recently released Occupational Information Network. As the use of the O*NET will effect nearly all aspects of organizational development and human resource management practices, it is critical that educators have an understanding of O*NET and how it can be used in workforce development initiatives and in the classroom to enhance teaching in the area of human resource management. The authors of this paper did not participate in the original research and development of the O*NET taxonomy but have been pioneers in its conceptual and practical use. The authors seek to expand awareness in order to engage academic and business professionals in identifying new ways to use this tool and take workforce development to the next level. Additionally, since the United States Government's Uniform Guidelines (Government Printing Office, 1978) mandates that all tests and other selection procedures which are used as a basis for any employment decision should be grounded in a job analysis, this paper introduces a new job analysis process based on the O*NET taxonomy. Specifically the paper will discuss a revolutionary framework for conducting job analyses using O*NET based SkillObjects™, and introduce how SkillObjects provide the necessary information for curricular development.

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Executive Summary of Proposal

The purpose of the paper is to introduce business professors and professionals to the recently released Occupational Information Network (O*NET), a replacement to the US DOL Dictionary of Occupational Titles. As the use of the O*NET will effect nearly all aspects of organizational development and human resource management practices, it is critical that educators have an understanding of O*NET and how it can be used in workforce development initiatives and in the classroom to enhance teaching in the area of human resource management. The authors of this paper did not participate in the original research and development of the O*NET taxonomy but have been pioneers in its conceptual and practical use. The authors seek to expand awareness in order to engage academic and business professionals in identifying new ways to use this tool and take workforce development to the next level. Additionally, since the United States Government's Uniform Guidelines (Government Printing Office, 1978) mandates that all tests and other selection procedures which are used as a basis for any employment decision should be grounded in a job analysis, this paper introduces a new job analysis process based on the O*NET taxonomy. Specifically the paper will discuss a revolutionary framework for conducting job analyses using O*NET based SkillObjects™, and introduce how SkillObjects provide the necessary information for curricular development.

Introduction

The explosive growth of the Internet along with an increasing focus on globalization has escalated three major business problems to critical status: how to build and maintain a descriptive workforce database in an culture that is experiencing rapid skill & knowledge obsolescence; how to find and extract relevant workforce development knowledge from multiple, changing sources; and how to format and present that knowledge so that business, education, and government executives can easily leverage it to shorten problem solving and concept building cycle times. In order to address these issues the United States Department of Labor has developed the Occupational Information Network (O*NET) as an online replacement for the *Dictionary of Occupational Titles*. This paper introduces the O*NET model in addition to discussing a revolutionary framework for conducting job analyses using O*NET based SkillObjects.™ An introduction to how SkillObjects provides the necessary information for curricular development is also presented.

Introduction to the Occupational Information Network

The Occupational Information Network (O*NET) is a comprehensive database of worker attributes and job characteristics. As the replacement for the *Dictionary of Occupational Titles* (DOT), O*NET will be the United States primary source of public occupational information. O*NET is being developed as a timely, easy-to-use resource that supports public and private sector efforts to identify and develop the skills of the American workforce. It provides a common language for defining and describing occupations. In addition, through "O*NET On-Line" (http://online.onetcenter.org/) occupational information is moving into the technological age in a way never seen before (National O*NET Consortium, 2001).

It is expected that the O*NET database will serve as an engine that drives value-added applications designed around its core information. O*NET provides the essential foundation for facilitating career counseling, education, employment, and training activities. The database contains information about knowledge, skills, abilities, interests, general work activities

(GWA's), and work context. O*NET data and structure will also link related occupational, educational, and labor market information databases to the system.

Specifically, some newly available and public domain applications include the O*NET Interest Profiler and the O*NET Work Importance Locator. An O*NET Ability Profiler is expected to be released in 2001. The development and release of these applications is an exciting event because it allows educators and business professionals to use the O*NET immediately in their businesses and in classes. Additionally, as the tools have been created under Federal contract they are in the public domain and only require a minimal cost recovery investment for the actual forms with many of the associated manuals being available for downloading free of charge. The following link will take the reader to more information about these tools http://www.onetcenter.org/tools.html#profiler.

O*NET Conceptual Framework

The conceptual foundation of O*NET is called the Content Model (http://www.onetcenter.org/content.html). The Content Model provides a framework for classifying, organizing, and structuring O*NET data and was developed using extensive research from the field of job and organizational analysis. The Content Model, depicted below is organized into six major domains. These are: Worker Characteristics, Worker Requirements, Experience Requirements, Occupation Requirements, Occupational Characteristics, and Occupation-Specific Information (National O*NET Consortium, 2001). The following sections taken from the O*NET Center website briefly describe the information included within each domain. A complete analysis of the content model can be found in the 800 page O*NET Data Dictionary (Government Printing Office, 1998) available online (http://www.access.gpo.gov/o_net/datadict/datadict.pdf).

The Content Model Forming the Foundation of O*NET (National O*NET Consortium, 2001)

Worker Characteristics (enduring traits that influence a person's

performance on the job)
Worker Characteristics are enduring characteristics that might influence both performance and the capacities to acquire knowledge and skills required for effective work performance. Worker characteristics comprise enduring qualities of individuals that may influence how they approach tasks and how they acquire work-relevant knowledges and skills. Traditionally, abilities have been the most common technique for comparing jobs in terms of these characteristics.

Worker Requirements (attributes acquired through experience and/or education)
Worker Requirements are a category of descriptors referring to work-related attributes acquired and/or developed through experience and education. Worker requirements represent developed or acquired attributes of an individual that may be related to performance. Knowledge represents the acquisition of facts and principles about a domain of information. Experience lays the foundation for establishing procedures to work with given knowledge. This set of procedures is more commonly known as skills. Skills may be further divided into basic skills (skills, such as reading, that facilitate the acquisition of new knowledge) and cross-functional skills (skills, such as problem solving, that extend across several domains of activities).

Experience Requirements (training and experience needed)
Experience Requirements are requirements related to previous activities; explicitly linked to certain types of work activities. This domain includes information about the typical experiential backgrounds of workers in an occupation or group of occupations. Certification, licensure, and training data also are identified. For example, information about the professional or organizational certifications required for entry and advancement, preferred education or training, and required apprenticeships are documented by this part of the model.

Occupational Characteristics (labor market-related information)
Occupational Characteristics are variables that define and describe the general characteristics of occupations that may influence occupational requirements. Organizations do not exist in isolation. They must operate within a broader social and economic structure. To be useful, an occupational classification system must incorporate these global contextual characteristics. O*NET provides this information by linking descriptive occupational information to statistical labor market information. This includes compensation and wage data, employment outlook, and industry size information.

Occupational Requirements (actual work performed on the job)
Occupational Requirements are a comprehensive set of variables or detailed elements that describe what various occupations require. This domain includes information about typical activities required across occupations. Task information is often too specific to describe an occupation or occupational group. The O*NET approach is to identify 42 generalized work activities (GWA) or dimensions that

summarize the kinds of tasks that may be performed within multiple occupations. Using this framework it is possible to use a single set of descriptors to describe many occupations. Contextual variables (e.g., the physical, social, or structural context of work) that may impose specific demands on the worker or activities are also included in this section.

Occupation-Specific Information
Occupation-Specific Information reflects variables or other Content Model elements in terms of selected or specific occupations. Occupation-specific information details a comprehensive set of elements that apply to a single occupation or a narrowly defined job family. This domain parallels other Content Model domains in that it includes requirements such as knowledge, skills (46 basic and cross functional skill identified), tasks, and machines, tools, and equipment. Similarly, labor market information defined by industry or occupation is also provided here. This domain is particularly important when developing specific applications of O*NET information. For example, to specify training, develop position descriptions, or redesign jobs, it is necessary to refer to occupation-specific descriptive information.

Because of the detailed, well-researched foundation provided by the O*NET taxonomy, many products and processes are being developed to utilize the advantages of the O*NET taxonomy. One such approach is called SkillObject technology. It offers job/task analysis data that is more detailed than almost any available previously, with cycle times that historically have been impossible. The benefit of O*NET based products and processes is that they offer new tools for educators in developing curriculum, training, and education to meet the needs of their constituents. This will be explored in more detail in the following section.

SkillObjects™

SkillObjects™ technology, based on the O*NET taxonomy, transforms workforce information into knowledge by capturing work, worker, and workplace characteristics and their relationships to performance.

The increasing pace of change in the technology sector has escalated three major business problems to critical status:

- how to build and maintain a descriptive workforce database in an culture that is experiencing rapid skill & knowledge obsolescence; and
- how to find and extract relevant workforce development knowledge from multiple, changing sources; and
- how to format and present that knowledge so that business, education, and government executives can easily leverage it to shorten problem solving and concept building cycle times.

Business development, trainers, educators, and career placement professionals generally have antiquated diagnostic tools that are ineffective for New Economy jobs. SkillObject™ Technology incorporates “best-in-class” advances in occupational science and is a contemporary solution to managing workforce investments.

Current Approaches

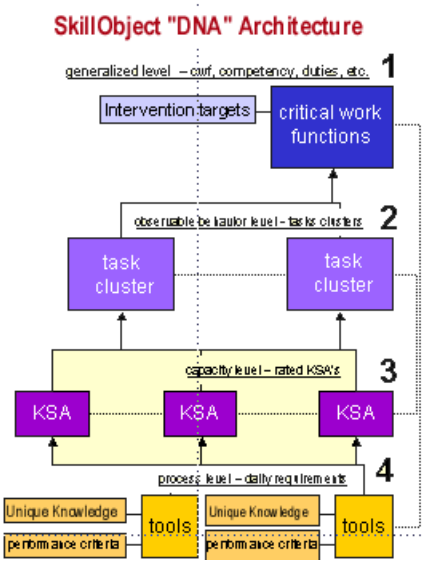
Organizations today are inundated by skill and knowledge system providers offering work or worker descriptors claiming to meet management needs, however, none addresses the work at the level required to provide management everything they need. Most applications are designed to provide management a "snapshot" of workforce development needs using job titles or job classifications. Most of the job titles are too broad, are rapidly becoming obsolete or have been completely eliminated. Job titles that survive have different meanings to different organizations. A systems analyst has one meaning to an electrical company and a different meaning to a consumer products company. So, even if current approaches are successful, the analysis does not provide management the adequate knowledge to make an informed decision.

In fact, traditional approaches may actually impede critical workforce development activities because recommendations are too general and not contextualized to the organization's culture. While some offer extensive workforce development analysis, current approaches are costly, time-intensive, and cannot keep pace with current organizational growth and change.

Revolution in Job Analysis

SkillObjects™ provides the next paradigm in understanding work by using an Internet-based job/task analysis process eliminating the need to have workers travel, thereby minimizing cost associated with lost time from work and travel. SkillObjects™ technology has embedded O*NET common language descriptors for Skills & Abilities and provides a valid framework to define unique tasks, tools, and knowledge requirements to perform Critical Work Functions (CWF's). Unlike job titles or classifications CWF's can be standardized to represent work for one or more job titles. The New Economy worker must be cross-trained to meet performance demands, and interventions or training events pointed to CWF's are more efficient and measurable. Knowledge of the appropriate CWF's and SkillObjects™ required to perform work, regardless of the job title, allows management to leverage performance capacity.

Harnessing SkillObjects™ data linked to CWF's provides management with valuable knowledge and insight to workforce development needs. The SkillObjects™ database can be used to improve training & development content, performance measurement tools, and job recruitment and placement systems.



A Technology Breakthrough

SkillObjects™ technology is a product of 10 years of research & development. The research challenge was to reinvent a highly technical craft linking mostly industrial psychologist to a smart application enabling the teacher, trainer, marketing manager and others to perform a Job/Task analysis while maintaining stringent industry guidelines. General Electric, Thomas & Betts, AT&T, Graybar Electric, and other notable corporations joined, George Mason University, Georgia Tech, University of Nebraska, and the US Department of Defense to assist SkillsNET's effort to reinvent the process.

The Process

Using workers that perform the work is central to the SkillObjects™ process. It has been learned that if a worker is asked, "what do you do", the worker will often rely upon his or her memory of recent tasks and is unable to provide a comprehensive description of critical tasks and duties performed. To help the worker the SkillObjects™ process uses an intelligent queuing technique that challenges the worker to think critically about their work. This is accomplished by using a series of well-designed templates. The templates begin with broad descriptions of work and continue until the worker has developed a comprehensive list of tasks, tools, knowledges, skills, and abilities, all of which are evaluated and surveyed by other workers and placed in the SkillObjects™ database.

SkillObjects and Curriculum Development

The implementation of SkillObjects™ technology generates quantum leaps in workforce productivity and innovation among business, education and state leaders and enables a paradigm shift in organizations that supports the creation of an e-Skills Community Portal. The e-Skills Community Portal provides a level playing field to all corporations and their education and training providers. The SkillObjects™ database contains descriptors for hundreds of occupations and can be customized to meet specific workforce development training needs.

The modular structure of the SkillObject (see Appendix), with its cluster of interrelated tasks, the tools/software/devices required to perform the tasks, the unique knowledge required to perform the tasks, the skills and abilities required to perform the tasks, as well as the normative data for each task, tool, unique knowledge, skill and ability provides all of the information required to develop curriculum for education and training courses. Additionally, because of SkillObjects' modular structure, it is very easy to develop a modularized curriculum approach that works very well in traditional delivery approaches or equally well in web-based delivery approaches.

Because of the detailed data provided by the SkillObjects, it is very simple to develop a modularized curriculum to prepare people to enter the occupation, or to provide targeted learning interventions for current employees. In the state of Texas, a statewide group of telecommunications companies worked jointly to develop the standards for Telecommunications Maintenance Technicians. Based on the data collected during the project, a statewide core curriculum was developed. This curriculum is offered at community colleges, technical schools, and universities across the state.

Additionally, SkillObject technology has been utilized to determine work activities performed by people worldwide who have CISCO certifications. This effort served two purposes: 1) to validate the content of existing curricula for the CCNA, CCNP, CCDA, and CCDP certifications; and 2) to determine the work-based activities of IT professionals who hold the certifications, which are not supported by the certification curricula. This has allowed CISCO to develop additional curricula for new certifications and specializations.

Summary

The Department of Labor's Occupational Information Network is a replacement to the Dictionary of Occupational Titles, and it is an effective taxonomy for describing work, worker, and workplace characteristics. As the use of the O*NET is effecting nearly all aspects of

organizational development and human resource management practices, it is critical that educators understand O*NET and how it can be used in workforce development initiatives and in developing educational and training curricula that meet both students' and employers' needs. The revolutionary SkillObject technology now being used nationwide utilizes the O*NET taxonomy to collect work, worker, and workplace characteristics at the task level as opposed to most job analysis methods, which collect data at the job title level. This differentiation, along with the ease of collecting and keeping the data current, has major implications for curriculum development, training, manpower and staffing, recruiting, retention, promotion, classification, organizational readiness, and organizational effectiveness.

APPENDIX

Sample SkillObject™

SkillsNET SkillObject™ Sample

Occupation: Secretary

Job Family: Business Administrative Support Occupations

Economic Sector: Business, Finance, and Management

Source: ABC Corporation, Dallas, Texas

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SkillsNET Corporation

310 West Jefferson
Waxahachie, Texas 75165
Internet: www.skillsnetcorp.com

SkillObject™ Metadata Summary

SkillObject™ Name: **.....Writing Reports/Information**

SkillObject™ ID Number: **.....01384**

Economic Sector: **.....Business, Finance, and Management**

Job Family: **.....Business Administrative Support Occupations**

Job Title: **.....Secretary**

Coverage (National, State, Regional): **.....State**

Source: **.....XYZ Corporation**

Source Location: **.....Dallas, Texas**

Elements Included: **.....**

Tasks:	X
Tools/Software/Equipment:	X
Unique Knowledges:	X
O*NET Skills:	X
O*NET Abilities:	X
Performance Criteria:	
Normative Data:	
Tasks:	X
Tools/Software/Equipment:	X
Unique Knowledges:	X
O*NET Skills:	X
O*NET Abilities:	X

Date Created:**.....07/01/1999**

Date Last Updated:**.....08/01/2000**

Expiration Date:**.....08/01/2001**

Critical Work Function: **.....Documentation Development**

Intra-Office Communications

Known Learning Objects:**.....Not Applicable**

Skills Compliance Officer:**.....Dr. Darrel Sandall**

Skills Analyst:**.....Elizabeth Worth**

SkillObject™ Sample

SO ID	*SkillObject™ Name*
01384	**Writing Reports/Information**

Task ID	*Task Statement*
15	Communicate instructions for operation or repair of equipment to others. *Primary O*NET Skill: Writing* *Primary O*NET Ability: Information Ordering*
87	Communicate work progress and tool/equipment problems to others. *Primary O*NET Skill: Writing* *Primary O*NET Ability: Problem Sensitivity*
64	Enter detailed information of procedure on computer. *Primary O*NET Skill: Writing* *Primary O*NET Ability: Wrist-Finger Speed*
147	Prepare reports on job procedures for future reference. *Primary O*NET Skill: Writing* *Primary O*NET Ability: Information Ordering*
125	Update equipment manuals with any details or new information that is not already included in the manual. *Primary O*NET Skill: Writing* *Primary O*NET Ability: Information Ordering*

ID	*Tools/Software/Equipment*
1	Computerized maintenance management system (e.g. MIMS)
3	Inventory status books
4	Log books

ID	*Unique Knowledge*
3	Equipment and maintenance manual layouts
4	Departmental filing procedures
10	OSHA safe job procedures

Survey Normative Ratings

Task Ratings:

Task ID	*Frequency**	*Criticality**	*When Needed**	*Diff. to Learn**
15	3.55	3.21	1.89	2.71
87	3.74	3.09	1.53	2.87
64	2.25	2.56	2.78	3.22
147	1.76	3.13	2.95	3.62
125	1.35	2.65	3.20	3.31

Tool/Software/Equipment Ratings:

Tool ID	*Frequency**	*Criticality**	*When Needed**	*Diff. to Learn**
1	4.22	4.26	1.45	2.15
3	2.53	2.80	1.57	1.93
4	2.78	2.30	1.48	1.43

Unique Knowledge Ratings:

Knowledge ID	*Frequency**	*Criticality**	*When Needed**	*Diff. to Learn**
3	2.50	2.79	1.59	2.78
4	2.31	2.29	1.64	1.96
10	4.25	4.29	1.51	3.09

Skill Ratings:		***Normative Level (1-5 scale)****
3	Writing	3.34

Ability Ratings:		***Normative Level (1-5 scale)***
10	Information Ordering	2.76
7	Problem Sensitivity	2.18
30	Wrist-Finger Speed	3.04

** See the Survey Rating Key on the next page*

Survey Normative Rating Scale Keys

Survey Key for Tasks

Frequency	Criticality	When Needed	Difficulty to Learn
How frequently do you perform the task?	How serious are the consequences of poor task performance?	When is the task needed?	How long is required to learn how to properly perform the task?
0=Does not apply 1=More than once per year 2=More than once per month 3=More than once per week 4=Daily 5=Several times per day	0= Does not apply 1= No serious consequences 2= Least serious consequences 3= Moderately serious consequences 4= Serious consequences 5= Most serious consequences	0=Does Not Apply 1=Job Entry 2=0 to 3 months 3=3 to 6 months 4=6 to 12 months 5=1 to 2 years	0=Does Not Apply 1=One day 2=One week 3=One month 4=Six months 5=Greater than 6 months

Survey Key for Tools/Software/Equipment

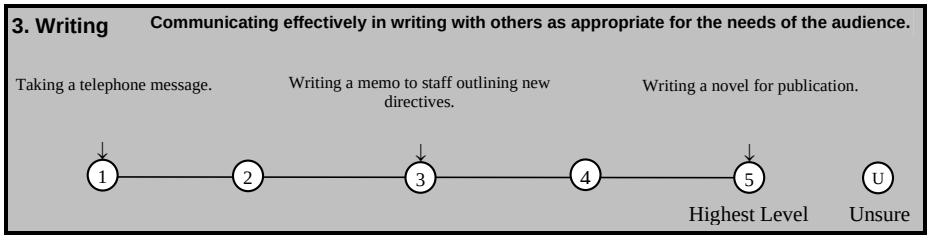
Frequency	Criticality	When Needed	Difficulty to Learn
How often is this tool utilized in your job?	How critical is proper use of this tool in the performance of your job?	When is the ability to use this tool required in your job?	How long is required to learn how to properly use this tool?
0=Does not apply 1=More than once per year 2=More than once per month 3=More than once per week 4=Daily 5=Several times per day	0= Does Not Apply 1= Not Critical 2= Somewhat Critical 3= Critical 4= Very Critical 5= Extremely Critical	0=Does Not Apply 1=Job Entry 2=0 to 3 months 3=3 to 6 months 4=6 to 12 months 5=1 to 2 years	0=Does Not Apply 1=One day 2=One week 3=One month 4=Six months 5=Greater than 6 months

Survey Key for Unique Knowledges

Frequency	Criticality	When Needed	Difficulty to Learn
How often is this knowledge utilized in your job?	How critical is this knowledge to the performance of your job?	When is this knowledge required in your job?	How long is required to learn this knowledge?
0=Does not apply 1=More than once per year 2=More than once per	0= Does Not Apply 1= Not Critical 2= Somewhat Critical 3= Critical	0=Does Not Apply 1=Job Entry 2=0 to 3 months 3=3 to 6 months	0=Does Not Apply 1=One day 2=One week 3=One month

month 3=More than once per week 4=Daily 5=Several times per day	4= Very Critical 5= Extremely Critical	4=6 to 12 months 5=1 to 2 years	4=Six months 5=Greater than 6 months

Survey Key for Skill: Writing



References

Government Printing Office. (1978) Section 60-3, Uniform Guidelines on Employee Selection Procedure (1978); 43 FR 38295 (August 25, 1978). Retrieved September 10, 2001 from http://www.dol.gov/dol/esa/public/regs/cfr/41cfr/toc_Chapt60/60_3_toc.htm .

Government Printing Office. (1998) O*NET 98 data dictionary. Retrieved September 10, 2001 from http://www.access.gpo.gov/o_net/datadict/datadict.pdf .

National O*NET Consortium (2001) About O*NET Content Model. Retrieved September 10, 2001 from http://www.onetcenter.org/content.html .

National O*NET Consortium (2001) O*NET On-Line . Retrieved September 10, 2001 from http://online.onetcenter.org/ .

National O*NET Consortium (2001) What is O*NET. Retrieved September 10, 2001 from http://www.onetcenter.org/ .