

Introduction

In today's uncertain economic environment, standardized information about the characteristics of jobs is helpful to match job-seekers with vacancies, provide a foundation of basic information about occupations, and create the means for tracking changes in occupations over time, as well as for other purposes. The Occupational Information Network, called O*NET, which replaced the earlier printed *Dictionary of Occupational Titles* (DOT), provides such information in the form of an electronic database and related tools.

The first edition of the DOT appeared in 1939, when millions of American were out of work. Congress approved the Wagner-Peyser Act in 1933, creating the U.S. Employment Service in the U.S. Department of Labor (DOL). As called for in the law, DOL provided funds and assistance to the states to create a national network of public employment offices and also initiated a program of occupational research in order to help the new employment offices classify and match job seekers with jobs (National Research Council, 1980). This research program led to publication of the 1939 volume, which included concise definitions of approximately 17,500 jobs, presented alphabetically by job title; jobs were classified into one of 550 occupational clusters and were also defined as skilled, semiskilled, or unskilled.

GOALS AND PROGRAM MANAGEMENT

Although no formal mission statement for O*NET with specific goals has been published, the DOL Strategic Plan for 2006-2011 includes this goal (U.S. Department of Labor, 2006, strategic goal 2):

Meet the competitive labor demands of the worldwide economy by enhancing the effectiveness and efficiency of the workforce development and regulatory systems that assist workers and employers in meeting the challenges of global competition.

This overarching goal includes a more specific one: “Build a demand-driven workforce system by increasing the accessibility of workforce information through the National Electronic Tools” (performance goal 2E). The strategic plan lists the web interface used to access the O*NET database, O*NET OnLine, as one of these electronic tools, stating that it is to be used for two main purposes:

1. To support individuals in making education and training decisions and investments, and
2. To support business and community needs for a prepared and globally competitive workforce.

Another indication of the O*NET mission is its funding source. DOL provides funding for O*NET under the Wagner-Peyser Act, as part of a stream of funding dedicated to employment services. This funding stream includes a budget earmarked for workforce information, which in turn includes a line item for O*NET.

These statements and the funding source suggest that a primary goal of O*NET is to help state workforce development offices carry out their dual mission of assisting individuals in gaining challenging, rewarding work (and any required education and training) and assisting employers in recruiting, hiring, and developing skilled workers. In addition, O*NET is intended to be useful to other audiences, including human resource managers, students planning their future education and career paths, community-based organizations, and colleges and technical schools (e.g., National Center for O*NET Development, 2009a).

Program Management

DOL's Employment and Training Administration (ETA) manages the O*NET program through an annual grant to the North Carolina Employment Security Commission, which oversees the National Center for O*NET Development (the O*NET Center). The O*NET Center employs core staff

and, under ETA direction, manages projects to collect, evaluate, and disseminate O*NET information and related products and tools and provides technical support and customer service to O*NET users. The O*NET Center works in partnership with several other organizations (National Center for O*NET Development, no date):

- RTI International (RTI) designs, implements, and supervises the survey data collection designed to populate the O*NET database.
- The Human Resources Research Organization provides technical expertise on the O*NET content model and in the areas of data collection, job analysis, assessment, and training.
- North Carolina State University (NCSU) conducts research to support O*NET initiatives, such as identification of new and emerging occupations.
- MCNC, a nonprofit organization that uses advanced networking technologies to support learning and collaboration in North Carolina's education community, houses the O*NET database and provides Internet access and dissemination and strategic advice on technology.
- Maher & Maher provides web-based training services and products through the O*NET Training Academy to support the use of O*NET information.

COMPONENTS OF O*NET

At the heart of the O*NET program is a database of information on the characteristics of occupations (which are clusters of similar jobs) and their requirements of workers. The program consists of a content model, which is used to describe the characteristics of occupations, an ongoing data collection program to update information on these characteristics, and a program for the publication and maintenance of the database. To facilitate use of the database, the O*NET Center has also developed several related tools.

The Content Model

The content model organizes information on many different characteristics of occupations into a taxonomy that is structured hierarchically. At the highest or most general level, the content model organizes information into six categories, designed to provide multiple "windows" into the world of work (see Figure 1-1). These broad categories are referred to as *domains*.

At the next level of the taxonomy, each of these six domains includes subcategories of occupational information, also structured hierarchically

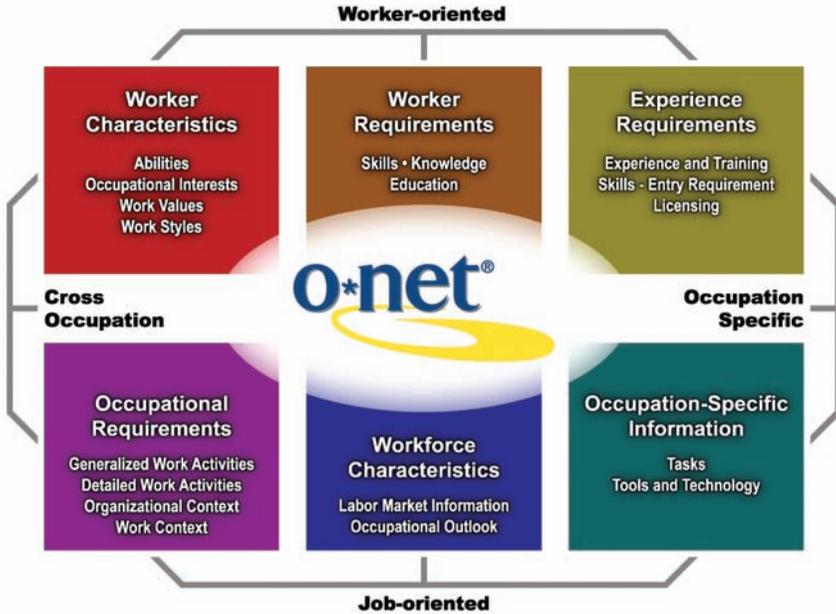


FIGURE 1-1 Overview of the O*NET content model.

SOURCE: National Center for O*NET Development (no date, a). Reprinted with permission.

and also known as domains.¹ Each domain, such as Abilities, Generalized Work Activities, and Tasks, is made up of the most specific information items in the taxonomy, called *descriptors*. Because these domains are also taxonomies, they are also referred to as *descriptor taxonomies*.

Each domain is organized hierarchically. For example, the Abilities domain includes three levels. The highest or most general level is comprised of four categories: cognitive, psychomotor, physical, and sensory (U.S. Department of Labor, 2008). Each of these four groups of abilities includes two levels of more specific descriptors (see Appendix B for the full hierarchy of domains and detailed descriptors). The six broad domains and the detailed domains they contain are described briefly below (some detailed domains are discussed more thoroughly in Chapter 2).

¹In biology, the word “domain” is reserved for the highest or most general level of the taxonomy, but in this report, “domain” refers to both the highest level and also to the second highest level of the O*NET content model.

1. **Worker Characteristics:** These are enduring characteristics of workers that may influence both performance and the capacity to acquire knowledge and skills required for effective work performance. This broad domain includes four more specific domains: Abilities, Occupational Interests, Work Values, and Work Styles.
2. **Worker Requirements:** These are work-related attributes that are acquired or developed through experience and education. This broad domain includes three more specific domains: Skills, Knowledge, and Education.
3. **Experience Requirements:** These are requirements that are explicitly linked to certain types of work activities, such as experience, training, licenses, and skills required for entry into the occupation.
4. **Occupational Requirements:** These are specific occupational requirements, including the following domains: Generalized Work Activities, Work Context, Detailed Work Activities, and Organizational Context.
5. **Workforce Characteristics:** This category includes variables describing the general characteristics of occupations that may influence occupational requirements. It includes labor market information (such as wage levels and employment levels) and occupational outlook information (such as projected future employment levels).
6. **Occupation-Specific Information:** This category of information describes characteristics that apply either to a single occupation or to a more narrowly defined job family. Currently, the database includes two descriptor taxonomies, Tasks and Tools and Technology.

The entire content model can be found at <http://www.onetcenter.org/content.html>.

Data Collection, Publication, and Expenditures

The National Center for O*NET Development and its partners collect data related to five of the six broad domains included in the content model, excluding the workforce characteristics category (see Figure 1-1). Workforce characteristics data are provided through links to the employment, wage, and long-term employment projections databases produced by the U.S. Bureau of Labor Statistics and state and local employment agencies (U.S. Department of Labor, 2008). To populate the other five, the O*NET Center collects some data, and its partners collect others.

The O*NET Center and its partners, RTI and NCSU, use multiple methods to collect data related to these domains and the more detailed descriptors within them. These methods include surveying a national sample

of establishments and their workers, supplemented by additional samples when necessary; surveying samples of occupational experts; and collecting data from occupational analysts, who are provided with updated data from the worker surveys.

In addition to these primary data collection activities, the O*NET Center collects data to populate two descriptor taxonomies, Tools and Technology and Detailed Work Activities, as well as data on lay job titles. After collection, the data are cleaned, nonresponse to surveys is analyzed at multiple levels, and weighting and estimation procedures are applied to account for nonresponse (U.S. Department of Labor, 2008). Finally, updated data are incorporated into, and maintained within, the O*NET database.

The first O*NET database, published in 1998, is known as the “analyst database” because it is comprised of data provided by trained occupational analysts (see Box 1-1). Over the next few years, the O*NET Center focused on developing data collection methods. In 2002, the O*NET Center launched a major data collection program aimed at populating the database with updated data by 2008, one decade after publication of the analyst database. To advance this goal, spending on data collection rose, reaching a peak of \$10.15 million in fiscal year 2003, as the O*NET Center conducted many waves of sampling (see Table 1-1). From 2002 to 2006, the O*NET Center collected updated information on approximately 200 occupations each year, publishing an updated database every six months (see Box 1-1).

In recent years, the pace of data collection has slowed. The O*NET Center has spent \$6.5 to \$6.8 million annually to collect and publish updated data on approximately 100 occupations each year. The current database, O*NET 14.0, released in June 2009, includes updated information on 833 of the 965 occupations for which data are gathered,² or 86 percent of these occupations. The 132 occupations that have not yet been updated are among the new and emerging occupations added to the O*NET-SOC (Standard Occupational Classification) system taxonomy in 2009. The O*NET Center has largely achieved the goal of populating the database with updated information.

O*NET Tools and Websites

In addition to developing, updating, and publishing the database that is the heart of O*NET, the National Center for O*NET Development has created several tools to facilitate its use:

²The O*NET occupational classification system includes 1,102 occupations, but data are not collected for all of these occupations.

- A website for public viewing and searching the database, O*NET OnLine (<http://online.onetcenter.org/>; see Chapter 5 for discussion of the website).
- A website with more detailed technical information that allows the database to be downloaded, the O*NET Resource Center (<http://www.onetcenter.org/>).
- A web-based application to assist workforce development professions in matching lay job titles with O*NET occupations, the O*NET Code Connector, available through a website, the O*NET Code Connector (<http://www.onetcodeconnector.org/>) and for download from the O*NET Resource Center website.
- A website providing a forum for users and developers to share knowledge, the O*NET Knowledge site (http://www.onetknowledgesite.com/onet_ks_home.cfm).
- A website providing education and tutorials on how to use O*NET, the O*NET Academy (<http://www.onetacademy.com/>).
- A suite of career exploration tools, including
 - the O*NET Ability Profiler
 - the O*NET Interest Profiler
 - the O*NET Computerized Interest Profiler
 - the O*NET Work Importance Locator
 - O*NET Work Importance Profiler.

These career exploration tools are designed to help individuals assess their work-related interests, what they consider important on the job, and their abilities in order to explore the occupations that relate most closely to those attributes. Printed versions of the Ability Profiler, the Interest Profiler, and the Work Importance Locator tools and their supporting documents are available for download from the O*NET Resource Center website and for purchase in quantity from the U.S. Government Printing Office. Electronic components of the Ability Profiler, the Computerized Interest Profiler, the Work Importance Locator, and the Work Importance Profiler are available for download from the O*NET Resource Center website.

A BRIEF HISTORY OF O*NET

In 1977, when the U.S. Employment Service published the fourth edition of DOT, the agency decided it would be timely to evaluate both the uses of this catalogue of job-related information and the research program underlying it. The agency called on the National Research Council (NRC) to conduct a critical review of DOT (National Research Council, 1980).

The NRC committee raised concerns about the extent to which the entire realm of civilian jobs was covered and the accuracy of the information.

BOX 1-1
Publication of O*NET Databases

O*NET 98 (October 1998):	Release of the original “analyst database” based on the Occupational Employment Statistical (OES) classification
O*NET 3.0/3.1 (August 2000/June 2001):	Database classification converted to conform to the new Standard Occupational Classification (SOC) system
O*NET 4.0 (June 2002):	Release of the final analyst database with a revised database structure consistent with the Data Collection Program approved by the Office of Management and Budget
O*NET 5.0 (April 2003):	First update of the database from the Data Collection Program with a comprehensive update of 54 occupations
O*NET 5.1 (November 2003):	Occupational-level and item-level metadata added to the O*NET database
O*NET 6.0 (July 2004):	Second update of the database from the Data Collection Program with a comprehensive update of 126 occupations
O*NET 7.0 (December 2004):	Third update of the database from the Data Collection Program with a comprehensive update of 100 occupations

O*NET 8.0 (June 2005):	Fourth update of the database from the Data Collection Program with a comprehensive update of 100 occupations
O*NET 9.0 (December 2005):	Fifth update of the database from the Data Collection Program with a comprehensive update of 100 occupations
O*NET 10.0 (June 2006):	Sixth update of the database from the Data Collection Program with a comprehensive update of 100 occupations; release of the updated O*NET taxonomy, O*NET-SOC 2006
O*NET 11.0 (December 2006):	Seventh update of the database from the Data Collection Program with a comprehensive update of 101 occupations
O*NET 12.0 (June 2007):	Eighth update of the database from the Data Collection Program with a comprehensive update of 100 occupations
O*NET 13.0 (June 2008):	Ninth update of the database from the Data Collection Program with a comprehensive update of 108 occupations
O*NET 14.0 (June 2009):	Tenth update of the database from the Data Collection Program with a comprehensive update of 117 occupations; release of the updated O*NET taxonomy, O*NET-SOC 2009

SOURCE: National Center for O*NET Development (2009b). Reprinted with permission.

TABLE 1-1 Expenditures by the National Center for O*NET Development

Fiscal Year	Expenditures (\$ millions)
1998	1.0
1999	3.2
2000	4.35
2001	5.46
2002	6.0
2003	10.15
2004	9.5
2005	8.5
2006	7.0
2007	6.5
2008	6.8
2009	6.5

SOURCE: Personal communication, Pam Frugoli, O*NET/Competency Assessment Team Leader, U.S. Department of Labor, August 3, 2009.

For example, the committee found that the occupational titles included were disproportionately concentrated in manufacturing; that nearly two-thirds of the occupational descriptions were based on observation of fewer than two jobs; that the number of occupational titles identified in some job families (e.g., processing, machine trades) was disproportionate to the representation of these job families in the labor force; and that three-fourths of the job analysis schedules (forms) used by occupational analysts to compile the dictionary did not meet the standards specified for a complete occupational analysis. In addition, the committee criticized the ratings of worker functions and traits made by job analysts (National Research Council, 1980).

The committee recommended not only improvements to the existing system of cataloging and describing jobs, but also substantial changes to the overall approach to organizing occupational information and the process for maintaining a robust database. Among its recommendations (National Research Council, 1980, pp. 13-14):

1. The occupational analysis program should concentrate its efforts on the fundamental activity of job analysis and on research and development strategies—for improving procedures, monitoring changes in job content, and identifying new occupations—that are associated with the production and continuous updating of the *Dictionary of Occupational Titles*.
2. A permanent, professional research unit of high quality should be established to conduct technical studies designed to improve the quality of the *Dictionary of Occupational Titles* as well as basic research designed

to improve understanding of the organization of work in the United States.

3. An outside advisory committee to the occupational analysis program should be established.

In addition, the committee recommended that DOL explore cross-occupational linkages of occupational information to identify possible areas of skills transferability; possibilities for increased alignment with federal job classification systems; and research on criteria for aggregating specific job titles into an occupation.

In 1990, DOL, following the NRC committee's recommendation to create an outside advisory panel to guide revisions to the DOT, established the Advisory Panel for the Dictionary of Occupational Titles (Advisory Panel for the Dictionary of Occupational Titles, 1993). As recommended by this panel, DOL sponsored a research and development project that led to creation of the prototype O*NET content model (Peterson et al., 1995, 1999). After pilot testing and revision of the initial content model, the prototype was revised slightly to create the current content model.

CHARGE TO THE PANEL

The Panel to Review the Occupational Information Network (O*NET) was charged to:

Conduct a top-level review of the O*NET program and the electronic database access program that supports it; to document the important current and potential future uses of O*NET in business, labor market functions, job matching systems, and human resource management; and to consider future directions for the program. The panel's investigation will be aided by the conduct of a workshop. The product of the study will be a final report with recommendations that will focus on means of strengthening the program and future directions for O*NET.

The panel will develop an inventory and evaluation of the uses of O*NET, in order to gain an understanding of the extent to which O*NET has become embedded in business, labor market functions, human resource practices, job matching systems such as Monster, human resource management information systems, and in international applications.

The linkage of the O*NET system with the SOC system, a key tenet of the program since its inception, will be documented and explored. The expert panel will use this information to assess the extent to which the opportunities for linking O*NET with employment, wage, demographic, and other occupational data have been realized.

Based on its assessment of the state of the system, the panel will seek

to identify opportunities to take O*NET to a new level. This will involve mapping out a system for the future that builds on O*NET successes and seeking ways to improve it, while maintaining the high quality standards and level of validity it has attained.

Some of the areas for which the panel will consider opportunities for enhanced functionality and improvement will be currency (how to capture changing and emerging skill needs in the economy and labor market with certainty and speed); efficiency; cost-effectiveness; use of new technology and collaborative approaches (to include Web 2.0 or “wiki” type processes in which those who provide input into the system are able to add to and update some items interactively online); means of capturing/documenting emerging skill changes and new and emerging occupations; and ways to foster seamless integration with the development and updating of industry competency models. It is expected that this review will lead to recommendations for potential cost savings and increased speed in turnaround time from identifying an occupation to being able to use the data in applications and in the field.

HOW THE PANEL APPROACHED THE CHARGE

The panel approached its charge through an iterative process of gathering information, deliberating on what was learned, identifying gaps, and seeking new information to fill the gaps. The panel obtained information on O*NET and key study issues from DOL and the O*NET Center, in both formal presentations and meetings and in ongoing information exchanges. The panel reviewed published literature in the fields of industrial/organizational psychology, human resource management, economics, and cognitive psychology, as well as unpublished “gray literature,” including business and trade documents.

Panel members also conducted informal telephone and e-mail surveys of the communities they represent, including the career development community, the workforce development community, the human resource management community, and the community of recent O*NET users. However, time and resource limits prevented the panel from conducting a systematic, national survey of O*NET users.

To gather information for the study, the panel convened a public workshop on uses of O*NET on March 26, 2009, and another on approaches to improving O*NET on April 17, 2009. Experts were asked to make presentations at these two workshops, and some of them also provided papers and other written materials. All materials received by the panel are available at http://www7.nationalacademies.org/cfe/ONET_Review.html.

Based on its review of these information sources, the panel reached conclusions and developed recommendations for improvements to O*NET,

presented in the following chapters. In some cases, the evidence was sufficient to support specific recommendations designed to enhance particular strengths or remediate specific weaknesses in O*NET. In many cases, however, the evidence that could be assembled and considered with the available resources and within the time frame of the study was insufficient, leaving the panel with unanswered questions. In these cases, the panel recommended further research and evaluation to address the questions. Recognizing that DOL will need technical expertise to carry out these recommendations and that new questions about O*NET will continue to emerge as a result of changes in jobs, the science of job analysis and data collection methods, technology, and other factors, the panel also recommends that DOL create an ongoing technical advisory board to evaluate and prioritize future research.

Because of limits on time and resources, the panel was unable to fully address one element in our charge—a review of international applications of O*NET. However, our review of uses of O*NET in human resource management and labor market research indicates that O*NET has been used for cross-cultural comparisons and in research on European labor markets (see Chapter 9). In addition, the National Center for O*NET Development (2009a) has documented tools and applications of O*NET developed in other countries for use in those countries, as well as translations to other languages.

Another area that the panel did not fully explore was the potential use of O*NET data in state and national education systems. Although we document uses of O*NET data to assist middle and high school students in college and career planning (see Chapter 6), we did not explore possible uses of O*NET data to inform workforce readiness certification programs, career pathways programs, development of career and technical education programs of study, state initiatives to increase access to and completion of postsecondary education, or state longitudinal education data systems. These potential uses of O*NET lay outside the study charge. In addition, the panel did not address the use of O*NET for vocational rehabilitation counseling, another area that lay outside the study charge.

ORGANIZATION OF THE REPORT

Part I describes and evaluates the core elements of O*NET. Chapter 2 covers the O*NET content model, Chapter 3 deals with the linkage of O*NET with the SOC system, and Chapter 4 addresses the currency of the data and the accuracy and cost effectiveness of current data collection methods. Chapter 5 examines the role of technology in supporting increased use of O*NET and comments on use of technology for data collection.

Part II includes the committee's inventory and evaluation of the major

current and potential uses of O*NET. Chapter 6 deals with the use of O*NET in state workforce development and career development, including the extent to which it has become embedded in labor market functions and job matching systems. Chapter 7 is an inventory and evaluation of its uses in business and human resource practices. Chapter 8 discusses an application for which O*NET is not currently used, but might potentially be in the future—the Social Security Administration’s disability determination process. Chapter 9 describes the research uses of O*NET data.

The panel’s detailed conclusions and recommendations appear at the end of each chapter.

Part III (Chapter 10) presents the panel’s recommendations for the future of O*NET. All recommendations are summarized and presented in order of importance, as seen by the panel.

Appendix A is a dissenting statement signed by two panel members. Appendix B presents the descriptor taxonomies included in the content model, and Appendix C presents brief biographies of panel members and staff.

REFERENCES

- Advisory Panel for the Dictionary of Occupational Titles. (1993). *The new DOT: A database of occupational titles for the twenty-first century (final report)*. Washington, DC: U.S. Department of Labor, Employment and Training Administration.
- National Center for O*NET Development. (2009a). *O*NET products at work*. Raleigh, NC: Author.
- National Center for O*NET Development. (2009b). *Production database-O*NET 14.0*. Available: <http://www.onetcenter.org/database.html> [accessed July 2009].
- National Center for O*NET Development. (no date). *The O*NET content model*. Available: <http://www.onetcenter.org/content.html> [accessed June 2009].
- National Research Council. (1980). *Work, jobs, and occupations: A critical review of the Dictionary of Occupational Titles*. A.R. Miller, D.J. Treiman, P.S. Cain, and P.A. Roos (Eds.). Washington, DC: National Academy Press. Available: http://www.nap.edu/catalog.php?record_id=92 [accessed May 2009].
- U.S. Department of Labor. (2006). *Strategic plan for fiscal years 2006-2011*. Available: http://www.dol.gov/_sec/stratplan/ [accessed May 2009].
- U.S. Department of Labor, Employment and Training Administration. (2008). *O*NET data collection program, Office of Management and Budget clearance package supporting statement, volume 1*. Raleigh, NC: Author. Available: http://www.onetcenter.org/dl_files/omb2008/Supporting_Statement2.pdf [accessed June 2009].