A National Jobs Information Database: Implications for Outcomes Assessment

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Abstract – The US Department of Labor/Employment and Training Administration's Occupational Information Network is the nation's primary source of occupational information. Data collected by Research Triangle Institute for purposes of populating the Occupational Information Network database were examined for their potential to facilitate outcomes assessment. Selected data were identified from a summary report for a single engineering occupation available from the Occupational Information Network and examined. The findings suggest that data collected by Research Triangle Institute can at the very least serve as a valuable adjunct to any outcomes assessment program. In the long term and as instructional programs continue to adapt, evolve, mature, and improve, the data can come to serve as the primary source and the basis for conducting outcomes assessment.

Keywords: Assessment, Engineer, Occupation, Occupational Information Network, Research Triangle Institute

INTRODUCTION

As the replacement for the Dictionary of Occupational Titles (DOT), the Occupational Information Network (O*NET) is the nation's primary source of occupational information. It exists to help employers, workers, educators, and students make informed decisions about education, training, career choices, and work. Its existence is realized by a database that contains information on hundreds of standardized and occupation-specific descriptors.

In order to remain relevant and timely, the database is continually updated through surveys of a broad range of workers from each occupation. Since 2002, Research Triangle Institute (RTI) has been responsible for compiling data that comprises the O*NET Collection Program [7]. They designed, implemented, and supervise the survey data collection process intended to populate the O*NET database and they provide guidance on continuous improvement efforts.

The O*NET Data Collection Program provides several hundred descriptive ratings based on O*NET questionnaire responses by sampled workers and occupational experts. The O*NET questions are organized into several different questionnaires covering various aspects of the occupation. Included among the data collected by RTI are the (a) enduring characteristics that may influence both work performance and the capacity to acquire knowledge and skills required for effective work performance, or what O*NET refers to as worker characteristics; (b) descriptors referring to work-related attributes acquired and/or developed through experience and education, or what O*NET refers to as worker requirements; (c) requirements related to previous work activities and explicitly linked to certain types of work activities, or what O*NET refers to as experience requirements; (d) variables or other elements of selected or specific occupations, or what O*NET refers to as occupation-specific information; (e) variables that define and describe the general characteristics of occupations that may influence occupational requirements, or what O*NET refers to as labor market characteristics; and (f) a comprehensive set of variables or detailed elements that describe what various occupations require, or what O*NET refers to as occupational requirements [4].

Workers and occupation experts sampled are randomly assigned to answer only one of several questionnaires. Each questionnaire takes approximately 30 minutes to complete. In addition to the questionnaires completed by workers and occupation experts, additional ratings are provided by occupation analysts and members of professional associations. Responses from all four sources—workers, occupation experts, occupation analysts and professional association members—are used to provide complete information for each occupation.

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O*NET OnLine is a Web-based application that provides user-friendly access to occupational information contained in the O*NET database—see Figures 1 and 2. It offers users the opportunity to (a) explore occupations; (b) search

Figure 1. O*NET OnLine Homepage

for occupations that take advantage of their skills; (c) explore related occupations; (d) study occupational summaries of the worker and requirements of the work; (e) study details of occupations, such as skills, knowledge, interests, and activities; (f) use crosswalks from other classification systems to find corresponding O*NET occupations; and (g) access other on-line career information resources [6].

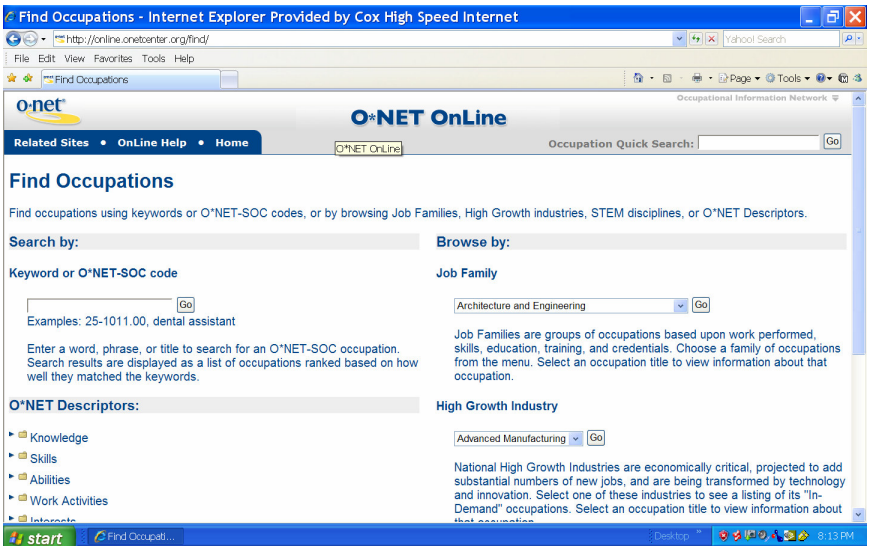

Figure 2. O*NET OnLine Find Occupations Page

The purpose of this investigation was to examine data collected by RTI for their potential to facilitate outcomes assessment.

METHOD

The O*NET Data Collection Program [10] is key to O*NET's relevance and effectiveness. The purpose of the data collection program is to provide data that are valid, reliable, current, and regularly updated.

Prior to initiating data collection, the U.S. Department of Labor (DOL) and the National Center for O*NET Development conducted, through RTI, an O*NET Data Collection Program Survey Pretest to evaluate the impact of alternative survey features on response rates. As a result, information is collected using a multiple method approach that includes a two-stage design in which a statistically random sample of businesses expected to employ workers in the targeted occupations will be identified and a random sample of workers in those occupations within those businesses are selected. New data are collected regularly by surveying job incumbents using standardized questionnaires. In addition, other populations are sampled to ensure high-quality occupational data collected efficiently [5].

Participants

Data are collected by means of surveys from several incumbent populations including (a) establishment workers—employees of economic endeavors identified by establishment points of contact (POC) guided by O*NET's sampling procedures, (b) trained analysts, (c) incumbents sampled from member rosters of professional associations, and (d) occupation experts. Neither establishment workers nor their POCs receive incentives. However, association members and occupation experts receive anywhere from $10 to $40 dollar incentives depending on their responsibilities. All incumbents are assured of the confidentiality of their responses. The surveys are reviewed and approved by RTI's Institutional Review Board in accordance with federal regulations governing the protection of human research subjects [8]. As well, very little personal information about the respondent is collected, and no identifying information, such as name or place of employment, is requested.

Materials

Four domain questionnaires are used to collect data from sampled workers: (a) Skills; (b) Generalized Work Activities, which are general types of job behaviors occurring on multiple jobs; (c) Work Context, the physical and social factors that influence the nature of work; and (d) Knowledge, which includes education and training and work styles. Data are collect by means of questionnaires on a fifth domain—Abilities—from trained analysts. Occupation characteristic and worker attribute data are also collected by means of questionnaires from job incumbents who are members of professional association. In addition to the four domain questionnaires, occupation experts are also asked to respond to demographic items and task inventories for their specific occupation.

Design

Three approaches are used to collect data: the Establishment Data Collection (EDC) method, the Association method, and the Occupation Expert (OE) method [10]. The primary data collection method is the EDC method.

The EDC method uses a sample design known as the General Employer Sample. It is a two-stage design that uses a statistical sample of establishments expected to employ workers in each specific occupation and a sample of workers in the occupations within each sampled establishment. The sampled workers, who are identified by establishment POC, are asked to complete the survey questionnaires.

With the Association method, association lists are sampled using a single-stage, stratified, simple random sampling approach. Stratification by geographic location and occupation subspecialty is considered if it is appropriate to the occupation. In most cases, the Association method is used in conjunction with the Establishment method in a dual-frame approach. To be considered, an association must represent the O*NET-Standard Occupational Classification or SOC System [9] occupation in the nature of the work performed by its members, contain a high percentage of the total occupational employment, and be willing to provide a list of its members. Professional associations, licensing authorities, and commercial companies are contacted for possible inclusion in the Association method. The sample selection procedures vary across associations, depending on the type of information available on association members.

The OE method is used for occupations that are also well represented by a professional or trade association, and a sample of occupation experts can be readily identified. For this method, stratified samples of experts are selected from lists of potential OEs. The potential experts are interviewed to determine whether they meet the specified criteria to serve as an OE for their respective occupations. Those meeting the criteria are then asked to complete all four O*NET domain questionnaires for their occupations—Skills, Generalized Work Activities, Work Context, and Knowledge.

According to *O*NET Data Collection Program*, a U.S. Department of Labor, Employment and Training Administration report [10] submitted to the Office of Management and Budget, the 70% establishment response rate and the 65% employee response rate exceeded expectations for surveys that use a similar approach to data collection.

Procedure

For the purpose of this investigation, occupational data were retrieved on civil engineers by clicking on the Architectural and Engineering Job Family (see Figure 2) and then browsing the Browse by Job Family page and clicking on Civil Engineers (see Figure 3).

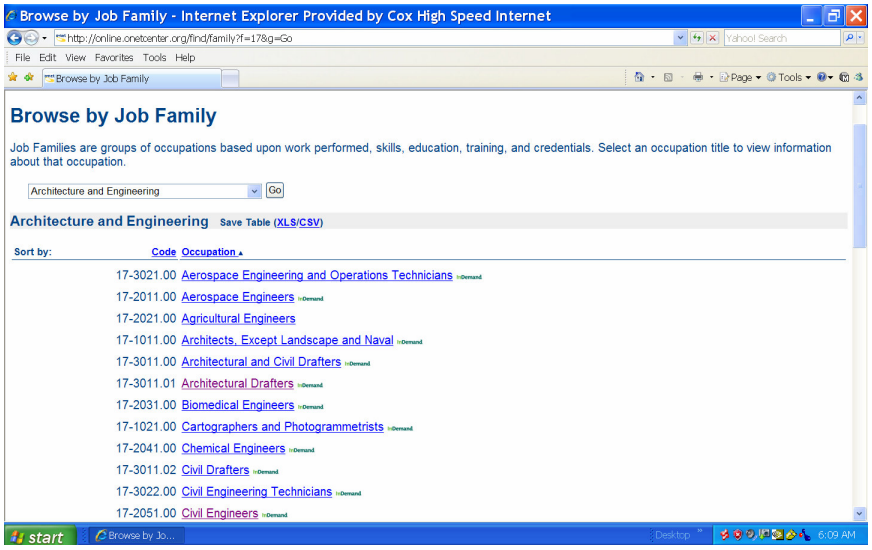

Figure 3. O*NET OnLine Sample Browse by Job Family Page

Clicking on Civil Engineers on the Browse by Job Family page takes the user to the civil engineers summary report page (see Figure 4).

Figure 4. O*NET OnLine Sample Summary Report Page

Summary reports provided an overview or snapshot of the selected occupation, focusing on the most important descriptors catagorize by content area. For each occupation, summary reports provided the following: (a) Occupation code, title, and definition; (b) Sample of Reported Job Titles (examples of job titles provided by

incumbent workers); and descriptors associate with the following 13 content areas: (a) Tasks (specific work activities that can be unique for each occupation); (b) Tools and Technology (information on the machines, equipment, tools, and software that workers may use); (c) Knowledge (organized sets of principles and facts that apply to a wide range of situations); (d) Skills (developed capacities that facilitate learning and the performance of activities that occur across jobs); (e) Abilities (enduring attributes of an individual that influence performance); (f) Work Activities (summarizes of the kinds of tasks that may be performed across multiple occupations); (g) Work Context (the physical and social factors that influence the nature of work); (h) Job Zone (ccupations with similar experience, education, and training requirements are grouped together into one of the five Job Zones. Ratings for Specific Vocational Preparation (SVP) are also provided); (i) Interests (indicate a person's preferences for work environments and outcomes); (j) Work Styles (the personal characteristics that can affect how well someone does a job); (k) Work Values (the global aspects of work that are important to a person's satisfaction); (l) Related Occupations (occupations similar to the selected occupation based on knowledge areas, skills, abilities, work environment, and work activities); and (m) Wages & Employment (summary national wage and employment data along with a links for obtaining state specific data).

Users may also access Details reports (see Figure 5), which display all descriptors for the selected occupation and, where available, a rating on how important each descriptor is to the occupation. In addition to the content areas provided in the summary report, details reports provide occupational information from two additional content areas: (a) Education, which provides summary data on the educational attainment of workers in this occupation and (b) Work Needs, which provides the more specific aspects of work that are important to a person's satisfaction.

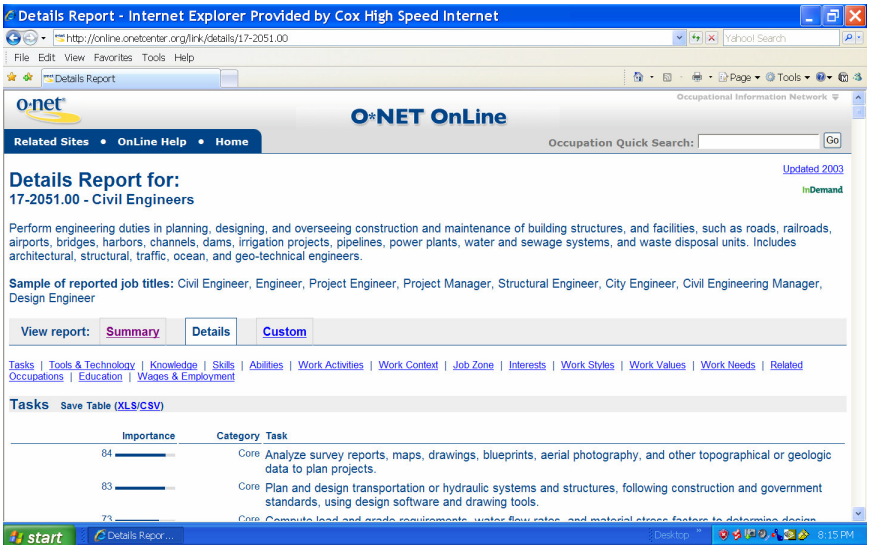

Figure 5. O*NET OnLine Sample Details Report Page

Custom Report is a third option available to the user. It provides the user with the ability to generate a tailored report about an occupation by offering them the flexibility to include only those items that meet their specified criteria.

For the purpose of this investigation, selected summary report data were chosen for examination. Specifically, the following were retrieved for examination: (a) Occupation code, title, and definition; (b) Sample of Reported Job Titles; (c) Tasks; (d) Tools and Technology; (e) Knowledge; (f) Skills; (g) Abilities; (h) Work Activities; (i) Work Styles; and (j) Wage data.

RESULTS

The purpose of this investigation was to examine data collected by RTI for their potential to facilitate outcomes assessment. Selected data were chosen from a summary report for a single engineering occupation—civil engineers—available from O*NET [3], the nation's primary source of information on jobs. Specifically, the following were retrieved for examination: (a) Occupation code, title, and definition; (b) Sample of Reported Job

Titles; (c) Tasks; (d) Tools and Technology; (e) Knowledge; (f) Skills; (g) Abilities; (h) Work Activities; (i) Work Styles; and (j) Wage data.

The occupation code, title, and definition were as follows: 17-2051.00; Civil Engineers; Perform engineering duties in planning, designing, and overseeing construction and maintenance of building structures, and facilities, such as roads, railroads, airports, bridges, harbors, channels, dams, irrigation projects, pipelines, power plants, water and sewage systems, and waste disposal units. Includes architectural, structural, traffic, ocean, and geo-technical engineers. Examples of job titles provided by surveyed incumbent workers included the following: Civil Engineer, Engineer, Project Engineer, Project Manager, Structural Engineer, City Engineer, Civil Engineering Manager, Design Engineer.

The specific work activities unique to civil engineering, or Tasks, are listed in Figure 6.

Analyze survey reports, maps, drawings, blueprints, aerial photography, and other topographical or geologic data to plan projects.
Plan and design transportation or hydraulic systems and structures, following construction and government standards, using design software and drawing tools.
Compute load and grade requirements, water flow rates, and material stress factors to determine design specifications.
Inspect project sites to monitor progress and ensure conformance to design specifications and safety or sanitation standards.
Direct construction, operations, and maintenance activities at project site.
Direct or participate in surveying to lay out installations and establish reference points, grades, and elevations to guide construction.
Estimate quantities and cost of materials, equipment, or labor to determine project feasibility.
Prepare or present public reports on topics such as bid proposals, deeds, environmental impact statements, or property and right-of-way descriptions.
Test soils and materials to determine the adequacy and strength of foundations, concrete, asphalt, or steel.
Provide technical advice regarding design, construction, or program modifications and structural repairs to industrial and managerial personnel.

Figure 6. Tasks

The machines, equipment, tools, and software, or Tools and Technology, a civil engineer may use are listed in Figure 7.

Tools used in this occupation: Compasses—Dividers; Distance meters—Electronic distance measuring devices, Rhodes arcs; Levels—Laser levels, Precision levels; Scales—Drafting scales, Rolling scales; Theodolites—Total stations.
Technology used in this occupation: Analytical or scientific software—HEC-1, HEC-HMS, Hydraulic modeling software, WinTR-55; Computer aided design CAD software—Autodesk AutoCAD, Mathsoft Mathcad, Road design software, Stormwater hydrology software; Data base user interface and query software—Data entry software, Microsoft Access, Trimble Geomatics Office; Map creation software—Cartography software, ESRI ArcInfo, ESRI ArcView, Intergraph MGE; Project management software—Cost estimating software, Microsoft Project, The Gordian Group PROGEN Online.

Figure 7. Tools and Technology

The organized sets of principles and facts that apply to a wide range of situations, or Knowledge, associated with civil engineering are listed in Figure 8.

Engineering and Technology (Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.)
Design (Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.)
Mathematics (Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.)
Building and Construction (Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.)
English Language (Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.)
Customer and Personal Service (Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.)
Administration and Management (Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.)
Transportation (Knowledge of principles and methods for moving people or goods by air, rail, sea, or road, including the relative costs and benefits.)
Public Safety and Security (Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.)
Computers and Electronics (Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.)

Figure 8. Knowledge

The developed capacities that facilitate learning and the performance of activities that occur across civil engineering jobs, or Skills, are listed in Figure 9.

Mathematics (Using mathematics to solve problems.)
Critical Thinking (Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.)
Science (Using scientific rules and methods to solve problems.)
Active Listening (Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.)
Reading Comprehension (Understanding written sentences and paragraphs in work related documents.)
Active Learning (Understanding the implications of new information for both current and future problem-solving and decision-making.)
Complex Problem Solving (Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.)
Monitoring (Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.)
Judgment and Decision Making (Considering the relative costs and benefits of potential actions to choose the most appropriate one.)
Negotiation (Bringing others together and trying to reconcile differences.)

Figure 9. Skills

The enduring attibutes that influence performance, or Abilities, of civil engineers is listed in Figure 10.

Deductive Reasoning (The ability to apply general rules to specific problems to produce answers that make sense.)
Oral Expression (The ability to communicate information and ideas in speaking so others will understand.)
Problem Sensitivity (The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.)
Near Vision (The ability to see details at close range—within a few feet of the observer.)
Oral Comprehension (The ability to listen to and understand information and ideas presented through spoken words and sentences.)
Written Comprehension (The ability to read and understand information and ideas presented in writing.)
Information Ordering (The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules—e.g., patterns of numbers, letters, words, pictures, mathematical operations.)
Speech Clarity (The ability to speak clearly so others can understand you.)
Visualization (The ability to imagine how something will look after it is moved around or when its parts are moved or rearranged.)
Inductive Reasoning (The ability to combine pieces of information to form general rules or conclusions—includes finding a relationship among seemingly unrelated events.)

Figure 10. Abilities

A summary of the kinds of tasks that may be performed by civil engineers, or Work Activities, is listed in Figure 11.

Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment (Providing documentation, detailed instructions, drawings, or specifications to tell others about how devices, parts, equipment, or structures are to be fabricated, constructed, assembled, modified, maintained, or used.)
Making Decisions and Solving Problems (Analyzing information and evaluating results to choose the best solution and solve problems.)
Interacting With Computers (Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.)
Communicating with Supervisors, Peers, or Subordinates (Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.)
Documenting/Recording Information (Entering, transcribing, recording, storing, or maintaining information in written or electronic/magnetic form.)
Thinking Creatively (Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.)
Organizing, Planning, and Prioritizing Work (Developing specific goals and plans to prioritize, organize, and accomplish your work.)
Getting Information (Observing, receiving, and otherwise obtaining information from all relevant sources.)
Estimating the Quantifiable Characteristics of Products, Events, or Information (Estimating sizes, distances, and quantities; or determining time, costs, resources, or materials needed to perform a work activity.)
Analyzing Data or Information (Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.)

Figure 11. Work Activities

The personal characteristics that can affect how well civil engineers do a job, or Work Style, are listed in Figure 12.

Dependability (Job requires being reliable, responsible, and dependable, and fulfilling obligations.)
Integrity (Job requires being honest and ethical.)
Attention to Detail (Job requires being careful about detail and thorough in completing work tasks.)
Initiative (Job requires a willingness to take on responsibilities and challenges.)
Analytical Thinking (Job requires analyzing information and using logic to address work-related issues and problems.)
Leadership (Job requires a willingness to lead, take charge, and offer opinions and direction.)
Self Control (Job requires maintaining composure, keeping emotions in check, controlling anger, and avoiding aggressive behavior, even in very difficult situations.)
Persistence (Job requires persistence in the face of obstacles.)
Achievement/Effort (Job requires establishing and maintaining personally challenging achievement goals and exerting effort toward mastering tasks.)
Stress Tolerance (Job requires accepting criticism and dealing calmly and effectively with high stress situations.)

Figure 12. Work Styles

National wage figures for civil engineers in 2006 and for civil engineers in the state of North Carolina are provided in Table 1.

Location		2006				
	Pay Period	10%	25%	Median	75%	90%
United States	Hourly	$21.55	$26.21	$32.98	$41.47	$50.20
	Yearly	$44,800	$54,500	$68,600	$86,300	$104,400
North Carolina	Hourly	$20.47	$24.62	$29.85	$36.72	$44.52
	Yearly	$42,600	$51,200	$62,100	$76,400	$92,600

Table 1. Wage Figures for Civil Engineers in 2006

DISCUSSION

O*NET is the nation's primary source of occupational information. It exists to help employers, workers, educators, and students make informed decisions about education, training, career choices, and work. Its existence is realized by a database that contains information on hundreds of standardized and occupation-specific descriptors. The database is updated on an ongoing basis through surveys of a broad range of workers from each occupation. Access by the public to occupational information is free through O*NET OnLine, an interactive application for exploring and searching occupations.

Barbara Derwart [2] notes that occupational information available through O*NET can be used by academic programs to, among other things (a) identify skills demanded by business and industry; (b) ensure programs are responsive to skill requirements; (c) identify core curricular requirements; (d) ensure appropriate skills are taught; (e) identify multiple occupations that may have similar skill and knowledge demands (ie core engineering skills and knowledge); (f) dialogue with local businesses and industry, advisory board, and graduates/alumni; (g) revise, validate, and update curricula; and (h) match student interests to carrier requirements.

Respectively, ABET's definitions of assessment and outcomes [1] include: (a) one or more processes that identify, collect, and prepare data to evaluate the achievement of program outcomes and program educational objectives and (b) narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program. Related is ABET's definition of objectives [1]: objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

As an example, the advancement of program graduates/alumni to positions of increasing responsibility can be a measure of a program's effectiveness in preparing graduates. For assessing graduate/alumni advancement, a simple survey item, similar to that which is depicted in Figure 13, can be used to collect data. Once the data are compiled, the summary data can be compared to the national and state wage figures—see Table 1.

Color in the bubble in the first column that best describes your per-year salary in your first job after graduating. Then color in the bubble in the second column that best describes your per-year current salary. If either job is/was part-time, give the approximate full-time equivalent per-year salary.

First job pre-tax gross annual salary ↓	Current job pre-tax gross annual salary ↓	
O	O	30,000-34,999
O	O	35,000-39,999…
O	O	60,000-64,999…
O	O	100,000 or more annually

Figure 13. Sample Survey Item for Assessing a Measure of Graduate/Alumni Advancement

A survey of civil engineering graduates/alumni, administered within a year or so of graduation, can query the graduates/alumni regarding their work activities (see Figure 14) using a Likert Scale. How frequently are the graduates/alumni engaged in these activities?

- Providing documentation, detailed instructions, drawings, or specifications to tell others about how devices, parts, equipment, or structures are to be fabricated, constructed, assembled, modified, maintained, or used.
- Analyzing information and evaluating results to choose the best solution and solve problems.
- Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.
- Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.
- Entering, transcribing, recording, storing, or maintaining information in written or electronic/magnetic form.
- Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.
- Developing specific goals and plans to prioritize, organize, and accomplish your work.
- Observing, receiving, and otherwise obtaining information from all relevant sources.
- Estimating sizes, distances, and quantities; or determining time, costs, resources, or materials needed to perform a work activity.
- Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.

Figure 14. Survey Items Intended to Ascertain Graduate/Alumni Work Activities

The scale that is depicted in Figure 15 can be used to solicit the extent to which graduates/alumni are engaged in those work activities.

Indicate the extent to which you are involved in the following work activities by coloring in the corresponding bubble.

Several times daily O	Once or so daily O	Several times a: Week O	Month O	Year O

Figure 15. Sample Likert Scale for Ascertaining Graduate/Alumni Work Activities

The scale depicted in Figure 16 can be used to solicit data pertaining to the importance of selected descriptors and the effectiveness of the preparation in that descriptor.

INSTRUCTIONS: The following reflect professional descriptors that you may have developed during your course of study. In the column on the left, circle the number that tells how important each descriptor is to you in your job. Circling a 1 means not important, circling a 6 means extremely important. In the column on the right, indicate how effective your major course of study prepared you for each descriptor. Circling a 1 means ineffective, circling a 6 means extremely effective.

Importance to you in your job	Descriptor	Effectiveness of preparation
1 2 3 4 5 6	Analyzing survey reports, maps, drawings, blueprints, aerial photography, and other topographical or geologic data to plan projects.	1 2 3 4 5 6

Figure 16. Alternative Sample Likert Scale

During the course of this investigation, selected data were chosen from a summary report for a single engineering occupation, civil engineers, for examination. Summary reports however only provide an overview or snapshot of the selected occupation and display only the most important descriptors. As a consequence, the findings are subject to the limitations of the summary report. For additional information on a given occupation, a details report should

be consulted. A details report displays all descriptors for the selected occupation, definitions of descriptors, and a rating of how important each descriptor is to the occupation.

CONCLUSIONS

The descriptors that characterize the various engineering occupations by O*NET can at the very least serve as a valuable adjunct to the various processes that identify, collect, and prepare data to evaluate the achievement of program outcomes and program educational objectives. The descriptors are at the very least the narrow statements that describe what engineering student should be expected to know and be able to do by the time they graduate. They relate to the skills, knowledge, and behaviors that students should acquire in their matriculation through their programs. The descriptors also contribute to and support the formation of broad statements that describe the career and professional accomplishments that the program is preparing its graduates to achieve. In the long term and as instructional programs continue to adapt, evolve, mature, and improve, the data can come to serve as the primary source and the basis for conducting outcomes assessment, augmented by other sources. While the data collected by RTI are reliable and valid, the fact that the data are based on "what is" curtails its usefulness to an extent. As a consequence, it must be augmented by other data that articulate "what should be".

REFERENCES

[1] ABET, Inc. (2006, November 10). *Accreditation Policy and Procedure Manual*. Retrieved September 16, 2007, from http://www.abet.org/Linked%20Documents-UPDATE/Criteria%20and%20PP/A004%2007-08%20Accredition%20Policy%20and%20Procedure%20Manual%2011-10-06.pdf

[2] Derwart, B. (2005, May 6). *O*NET CareerOneStop Tools*. Retrieved September 16, 2007, from http://www.workforceaguirre.com/quickplace/workforceaguirre/PageLibrary86256E23006A7BEE.nsf/h_Toc/ce74650ed84a043086256ffd00666407/?OpenDocument

[3] O*NET Online. (2003). *Summary Report for: 17-2051.00 - Civil Engineers*. Retrieved September 16, 2007, from http://online.onetcenter.org/link/summary/17-2051.00

[4] O*NET Resource Center. (n.d.a.). *The O*NET® Content Model*. Retrieved October 7, 2007, from http://www.onetcenter.org/content.html.

[5] O*NET Resource Center. (n.d.b.). *O*NET® Data Collection*. Retrieved September 16, 2007, from http://www.onetcenter.org/dataCollection.html

[6] O*NET Resource Center. (n.d.c.). *O*NET® OnLine*. Retrieved October 7, 2007, from http://www.onetcenter.org/online.html.

[7] RTI International. (2006, 28 February). *Data Collection Program*. Retrieved October 6, 2007, from https://onet.rti.org/survey.cfm.

[8] U.S. Department of Health and Human Services. (2005, June 23). *Protection of Human Subjects*. Retrieved September 16, 2007, from http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.htm

[9] U.S. Department of Labor, Bureau of Labor Statistics. (2007, February 16). *Standard Occupational Classification (SOC) System*. Retrieved September 16, 2007, from http://www.bls.gov/soc/

[10] U.S. Department of Labor, Employment and Training Administration. (2005, September 2). *O*NET Data Collection Program*. Retrieved September 16, 2007, from http://www.onetcenter.org/dl_files/omb2005/Supporting_Statement2.pdf

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