
Identification of “Hot Technologies” within the O*NET® System

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Background

This paper describes the initial identification of “Hot Technologies” within the O*NET System.

A “Hot Technology” is a technology requirement frequently included in employer job postings.

The purpose of identifying hot technologies is to enable a wide variety of customers -- students, job seekers, curriculum developers, employment and training providers, researchers, and policy makers -- to learn which software skills are in demand within the current United States economy. Hot technologies will be reviewed and updated on a quarterly basis. Within the primary O*NET websites, a fire icon indicates technologies that are currently hot (see Figure 1). The primary O*NET websites include:

- O*NET Online (www.onetonline.org);
- My Next Move (www.mynextmove.org);
- My Next Move for Veterans (www.mynextmove.org/vets); and
- Mi Proximo Paso (www.miproximopaso.org).

In addition, in the near future, the hot technology information will be available via the O*NET Web Services (<https://services.onetcenter.org/>), allowing developers to incorporate hot technologies within their products and services.

Tools and Technologies (T2s), *the machines, equipment, tools, information technology, and software that are important to occupational performance*, were initially included within the O*NET System starting in 2006. Currently, more than 67,000 tools and technologies have been identified across the 974 occupations included within the O*NET-SOC Taxonomy (see: <http://www.onetcenter.org/taxonomy.html>). The T2 database is available for download from the O*NET Resource Center (<http://www.onetcenter.org/database.html?p=3#t2>). The T2 information is also available via the O*NET Web Services.

To learn about the original process for populating the T2 database, see [O*NET Tools and Technology: A Synopsis of Data Development Procedures](#) and [O*NET Center Tools and Technology Quality Control Processes](#). In addition to these methods, customers and professional associations are given the opportunity to help update and maintain the T2 database by providing direct input on the T2 information for a particular occupation via the “Tools & Technology Feedback Process” (see: http://www.onetcenter.org/t2_feedback.html). Finally, employer job postings are being used as a new, rich source for identifying technology information.

In order to make the collected T2 information more manageable and user friendly, each

T2 example or “object” is organized into a taxonomic structure. Objects are classified according to the *United Nations Standard Products and Services Code* (UNSPSC). This system contains over 49,716 non-duplicative entries, and is organized into four levels of specificity (from most specific to least): Commodity, Class, Family, and Segment. For more details regarding the UNSPSC, see the organization’s website (www.unspsc.org). The classification facilitates a standard and common language for the T2 information. Importantly, it allows for cross-occupational comparisons at a more generic level than the specific T2 object language might allow.

Hot Technologies Identification Procedure

Mine data to collect the top technology related terms

This initial step analyzes millions of employer job postings across all occupations. The most frequently mentioned technology related terms (e.g., software and programming languages) are identified via data-mining software.

To operationalize this step initially, *Burning Glass Technologies* (www.burning-glass.com) was used to mine employer job postings from the calendar year 2015. Over 26.5 million job postings were searched. The 200 software and programming skill terms that were most frequently included in the job postings were identified.

Convert the data-mined technology terms into O*NET technologies

This step involves converting the mined terms into O*NET technology objects. Trained O*NET occupational analysts conducted a rational review of the identified terms. The review included:

- Examining the level of specificity of the terms;
- Combining or collapsing similar terms;
- Comparing the terms to existing O*NET technology objects and commodities to identify existing linkages;
- Updating the style and presentation format of those terms not linked to existing O*NET technology objects or commodities (e.g., adding the company name or spelling out identified acronyms).

During the initial operationalization of this step, 156 unique hot technologies were identified. A total of 153 of the hot technologies are at the O*NET object level, while three hot technologies are at the broader commodity level. For a listing of hot technologies identified during this first implementation, see Appendix A.

Organize the hot technologies within the O*NET Tools & Technology Taxonomy

This step involves finding the appropriate commodity linkage for each of the hot technology objects. For those identified as existing O*NET technology objects, the commodity linkage already existed. For new technology objects, trained O*NET occupational analysts reviewed the objects and made the commodity linkages. The recommended linkages were also reviewed and confirmed by members of the O*NET IT team.

For the initial implementation of this step, the 153 O*NET object-level technologies were linked to a total of 49 commodities within the O*NET Tools & Technology Taxonomy.

Link the hot technologies to O*NET-SOC occupations

The purpose of this step is to link the identified hot technologies to one or more of the 974 O*NET-SOC occupations in the O*NET-SOC 2010 Taxonomy. For hot technologies linked to existing O*NET technology objects, this step augments existing occupational linkages. For hot technologies that are newly identified technology objects, this step serves as the initial population of occupational linkages.

To begin the linking process, *Burning Glass Technologies* (www.burning-glass.com) was used to mine employer job postings from the calendar year 2015. The employer job postings related to each of the 156 hot technologies were examined. Specifically, for each hot technology, a listing of occupations for which employers included the original technology term within job postings was mined. Then, trained O*NET occupational analysts conducted a rational review of the occupation list and retained linkages based on content and face validity.

The outcome of this step led to the 156 hot technologies being linked to a total of 902 O*NET-SOC occupations.

Determine the display of occupations linked to a hot technology

The goal of this step is to present the O*NET-SOC occupations linked to each hot technology based on current employer demand. The occupations with the highest percentage of job postings mentioning a particular technology term will be listed first. The occupations included in a lower percentage of the technology's related job postings will be ranked lower.

Burning Glass Technologies (www.burning-glass.com) was used to mine employer job postings from the calendar year 2015. The employer job postings related to each of the 156 hot technologies were examined. The order of the occupations, minus those removed during the occupation linkage step described above, served as the initial presentation rank. Occupational linkages previously identified for a particular hot

technology, but not appearing in the current review of employer job postings, were placed at the bottom of the occupational listing. If more than one of these legacy occupational linkages existed, occupations were ordered within the list alphabetically by title.

This step lead to a median of 26 occupations displayed per hot technology. Depending on the particular hot technology, there is a wide range in the number of occupations presented, ranging from 8 to 828.

Summary

This paper describes the O*NET Center's initial identification of "Hot Technologies."

A "Hot Technology" is a technology requirement frequently included in employer job postings.

The concept of hot technologies was developed in order to enable a wide variety of customers --students, job seekers, curriculum developers, employment and training providers, researchers and policy makers -- to learn what types of software skills are in demand within the current United States economy. The hot technologies are incorporated within the primary O*NET websites. Hot technologies are distinguished by a fire icon. In the near future, the hot technology information will be available within the O*NET Web Services so that developers can easily incorporate this valuable addition within their products and services.

The procedural steps for identifying hot technologies were described, including:

- Mining data to collect the top technology related terms;
- Converting the data-mined technology terms into O*NET technologies;
- Organizing the hot technologies within the O*NET Tools & Technology Taxonomy;
- Linking the hot technologies to O*NET-SOC occupations; and
- Determining the display of occupations linked to a hot technology.

Future plans include a quarterly review and update of the hot technology information. In addition, the efficacy of other data mining tools will be examined, such as the tool being developed by the University of Chicago's Center for Data Science and Public Policy (DSaPP) for the Work Data Skills Cooperative (see: <http://dsapp.org/sustainability/>).

Figure 1: O*NET Hot Technology Icon



Appendix A: Hot Technologies Identified During the Initial Implementation

Adobe Systems Adobe Acrobat
Adobe Systems Adobe ActionScript
Adobe Systems Adobe AfterEffects
Adobe Systems Adobe Dreamweaver
Adobe Systems Adobe Fireworks
Adobe Systems Adobe Flash
Adobe Systems Adobe Illustrator
Adobe Systems Adobe InDesign
Adobe Systems Adobe Photoshop software
Advanced business application programming ABAP
AJAX
Apache Cassandra
Apache Hadoop
Apache HTTP Server
Apache Maven
Apache Pig
Apache Solr
Apache Struts
Apache Tomcat
Apple Final Cut Pro
Autodesk AutoCAD
Autodesk AutoCAD Civil 3D
Autodesk Revit
Bentley Microstation
Blackbaud The Raiser's Edge
Blackboard software
C
C#
C++
CA Erwin Data Modeler
Citrix software
Common business oriented language COBOL
Computer aided design CAD software
Computer aided manufacturing CAM software
Customer information control system CICS
Dassault Systemes CATIA software
Data entry software
Delphi software
Drupal
Dynamic hypertext markup language DHTML
Eclipse software
Enterprise JavaBeans

Enterprise resource planning ERP software
Epic Systems software
ESRI ArcGIS software
EXT js
Extensible HyperText Markup Language XHTML
Extensible markup language XML
FileMaker Pro software
Fund accounting software
Geographic information system GIS software
Google AdWords
Google Analytics
Handheld computer device software
Healthcare common procedure coding system HCPCS software
Hewlett Packard HP-UX
Hewlett Packard LoadRunner
Hibernate ORM
Human resource management software HRMS
Hypertext markup language HTML
IBM Cognos Impromptu
IBM Domino
IBM InfoSphere DataStage
IBM Notes
IBM Power Systems software
IBM WebSphere
Integrated development environment IDE software
Intuit QuickBooks
JavaScript
Job control language JCL
jQuery
KornShell
LAMP Stack
LexisNexis software
Linux
McAfee software
Medical condition coding software
Medical procedure coding software
MEDITECH software
Microsoft .NET Framework
Microsoft Access
Microsoft ActiveX
Microsoft Dynamics GP
Microsoft Dynamics software
Microsoft Excel
Microsoft Exchange Server
Microsoft Outlook
Microsoft PowerPoint

Microsoft Project
Microsoft Publisher
Microsoft SharePoint software
Microsoft SQL Server Reporting Services
Microsoft SQL Server software
Microsoft Visio
Microsoft Visual Basic
Microsoft Visual Basic Scripting Edition VBScript
Microsoft Visual Studio
MicroStrategy software
Minitab software
MongoDB
MySQL software
Nagios
National Instruments LabVIEW
Node.js
NoSQL software
Objective C
Oracle Business Intelligence Enterprise Edition
Oracle E-Business Suite Financials
Oracle Eloqua software
Oracle Hyperion software
Oracle Java
Oracle JavaServer Pages JSP
Oracle JD Edwards EnterpriseOne
Oracle JDBC
Oracle PeopleSoft Financials
Oracle PeopleSoft software
Oracle PL/SQL
Oracle Primavera Enterprise Project Portfolio Management software
Oracle Solaris
Oracle WebLogic Server
Perforce Helix software
PHP: Hypertext Preprocessor
PostgreSQL software
Practical extraction and reporting language Perl
PTC Creo Parametric
Puppet
Python
Qlik Tech QlikView
R
Red Hat Enterprise Linux
Red Hat WildFly
Relational database management software
Ruby on Rails
Sage 50 Accounting

SAP Business Objects software
SAP Crystal Reports
SAP software
SAS software
Splunk Enterprise
Spring Framework
SPSS software
StataCorp Stata
Structured query language SQL
Sybase software
Symantec security software
Tableau software
Tax software
Teradata Database
The MathWorks MATLAB
Transact-SQL
Unified modeling language UML
UNIX
Verilog
VERITAS NetBackup
Virtual private networking VPN software
Wireshark