



Sizing the Middle-Skill Employment Gap

Significant Opportunities in Data, Information & Computing

BATEC

National Center of Excellence in Computing & Information Technologies

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FORWARD

Industry and Academia are mutually incentivized to fix the middle-skill employment gap that presently exists in the fields of Computing and Information Technology

- Employers are struggling to find proficiently skilled, affordable talent.
- Educators are attempting to anticipate areas of growing demand, but aren't always receiving clear guidance and consistent answers.

Computing and Information Technology are both fields that are fast changing, and therefore, inherently difficult to “keep up with”. The employment gap exists because industry and academia, unless they are working in close collaboration, tend to drift apart in their understanding of the requirements for proficiency with advanced tools, new programming languages, and emerging skill standards. High growth economic cycles followed by deep corrections have only served to accentuate the tendency to drift apart.

Many different solutions have been experimented with in order to narrow the middle-skill employment gap...

- Companies have outsourced jobs and responsibilities to third-party organizations in an attempt to be more responsive to changes in either the skills required or in the size of the demand.
- Industry has increased its reliance on immigrant workers and advocated for an expansion of the H1-B visa program.
- Academic institutions have offered innovative work/study programs designed to improve the authenticity and efficacy of their student's experience.
- The Community College System has retrained displaced workers offering certificate programs and stackable credentials

The motivation for *Sizing the Middle-Skill Employment Gap* is our desire to begin a discussion about the underlying dynamics of middle-skill employment. This inaugural research report offers a quantified analysis of regional market needs and documents the preparation that candidates require for meaningful employment.

There is an opportunity for industry and academia to work collaboratively to narrow the gap. We have opportunities to rethink how we develop a more effective workforce and how we source new talent. Please join us in this discussion. The time to act is now.

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We would like to express our gratitude to the individuals and organizations that have made this report possible. First, we want to thank Broadening Advanced Technological Education Connections (BATEC) for their support of this research since its inception last year. In particular, we are grateful for the support of Lou Piazza and Deborah Boisvert from BATEC, the feedback from the industry executives of BATEC's National Visiting Committee and the contributions from the faculty and administrators of BATEC's Academic Partners. We would also like to acknowledge the contribution of TechAmerica in helping to coordinate the initial round of research for this project during its earliest stages.

We are honored to have brought together a team of partners that collectively have allowed us to blend a comprehensive set of actionable data, analysis and insights. Special thanks to Dan Meges at Chmura Economics & Analytics for coordinating the economic data modeling and Matt Waldo of Morris, Lloyd & Associates whose role for this report spanned writer, data analyst and project manager. We are also most grateful to the data delivery team at Wanted Analytics for helping us to select the appropriate set of job posting data for analysis. We would like to extend special thanks to the delivery team at Peoplebrite and to Roger Bigelow at Monster Worldwide for data processing and insights.

There are many who have contributed their ideas and input throughout this research project. That said, all errors, omissions, and views remain the responsibility of the authors.

About BATEC

www.batec.org

BATEC (Broadening Advanced Technological Education Connections), a National Science Foundation-funded Center for IT Education, is dedicated to the complex mission of developing career-focused pathways to high technology education and practical work experience for motivated, typically underserved high school, community college and university students in four urban regions – Boston, Chicago, San Francisco and Las Vegas. These four regions feature a high demand for skilled labor coupled with great opportunities for building new connections in skills training and workforce development.

About Monster

www.monstergovernmentsolutions.com

Monster Government Solutions works across cities, counties, states and nations to help build high performance workforces and drive economic as well as educational growth. We offer proven solutions such as real-time labor intelligence, veteran's employment transition, and online career communities to help seekers find meaningful and satisfying jobs and careers.

EXECUTIVE SUMMARY

The prevalence and importance of information technology jobs has grown substantially in the new millennium, even during times of economic recession. There are now more than 5.6 million IT workers nationally (BLS, 2013a).

IT job growth is expected to continue to outpace the average job growth, for all jobs, through 2020. IT job growth and skill requirements are so robust that there is a significant need to expand the number of workers with appropriate skills for these positions. Many employers agree that a “skills gap” exists and they expect this “skills gap” will widen in the short-term.

There are more than 5.6 million IT workers in the U.S.

Growth in IT jobs is expected to remain strong through 2020.

This report investigates and documents the dimensions of this gap in the areas of data, information and computing. We explored the legitimacy of the common assumption that job seekers need to possess a bachelor’s degree in order to satisfy the skill requirements of jobs in the IT profession. Using modeled economic data, we sized the employment opportunity available for skilled community college graduates. The data suggests that there are specific opportunities on both a national and a regional level for job seekers to obtain middle-skill entry points into IT careers.

The occupations studied include:

- Computer Systems Analysts
- Medical Records and Health Information Technicians
- Web Developers
- Big Data Cluster

Nationally, more than 296,000 persons are employed in middle-skill jobs in the occupations studied – or about 32% of total employment for this group of occupations as a whole. The middle-skill employment components are highest for Computer Systems Analysts and Medical Records and Health Information Technicians (132,978 and 96,120 persons respectively). The middle-skill portion of employment in all of the occupations studied is expected to grow nearly as fast as all jobs in these occupations over the next five years.

Almost a third of all jobs for this group of occupations are middle-skill.

The skill requirements of these middle-skill jobs can often be satisfied by graduates of a two-year degree program.

In this report, we used a variety of economic data to assess the quantitative alignment of workforce demand and educational readiness. We analyzed this alignment both nationally and in each of four metro areas (Boston, Chicago, Las Vegas, and San Francisco). This analysis, along with additional employment and wage data, and written analysis, are included with a profile of each of the four metro areas.

We created profiles of each of the four IT occupations. We used advanced data mining techniques and two analytics engines to yield rich, multi-level competency profiles that produced data aligned to current nationwide employer job requirements of the occupations studied.

There are clear patterns that emerge from our analysis:

1. Our analysis indicates that economic modeling, at the national level, is not by itself sufficient.
2. Modeling at the regional level suggests that there is wide variance among opportunities for colleges to add graduates to the workforce for specific occupations.
3. The data suggest that educational institutions are already doing an adequate job of keeping pace with the demand for Medical Records and Health Information Technicians nationally and in each of the four metropolitan areas studied.
4. The data suggest that educational institutions are not on track to keep pace with the demand for Computer Systems Analysts, Web Developers, and each of the three occupations in the Big Data Cluster. The workforce demands in these field will be significantly underserved if the status quo is maintained
5. The data suggest that the workforce demands for Computer Systems Analysts in Boston, Chicago and San Francisco will significantly outpace the rate of new graduates seeking employment in these same regional markets.
6. The data suggest that workforce demands for Web Developers in Boston, Las Vegas and San Francisco will outpace the rate of new graduates seeking employment in these same regional markets.
7. San Francisco and Boston are forecasted to have middle-skill employment gaps (workforce demands which are unsatisfied by the forecasted quantity of new graduates) in three of the occupations studied.

National research is insufficient to understand the dynamics of these workforce segments.

There is wide variance between metro areas with regard to workforce supply/demand issues.

Use of the data in this study can help identify and address state and regional market needs, test the feasibility of new academic programs and prepare students for high-paying, high-demand jobs in IT and other sectors.

We recommend using this report as a baseline for discussion convening key employers and regional educators to discuss entry level hiring needs and building the case for community colleges as a viable and ongoing talent pipeline for middle-skill talent.

Furthermore, the occupations of Computer Programmer, Applications Developer and Data Analyst represent opportunities for future research using the approach, data and methodologies of analysis that are used in this study.

INDUSTRY BACKGROUND

The Importance and Pervasiveness of IT

For the purpose of this report, IT jobs are those that require Information and Computing Technology as the primary job function. The U.S. Department of Labor has identified 25 occupations that it believes best represents this “technology occupational cluster” (O*Net, 2013). Using data from the U.S. Bureau of Labor Statistics, we estimate that jobs in this cluster numbered 5,679,050 in 2012. Many of these BLS job classifications did not exist ten years ago (BLS, 2013a).

The growth of these occupations stands in stark contrast to all jobs as a whole. Between 2001 and 2011, over 565,000 IT-related jobs were created in the United States, an increase of 22.2%. During this period, IT jobs grew more than 95 times faster than employment as a whole, which grew by only 0.2%. Even during the Great Recession and its aftermath, when overall jobs were declining, IT jobs grew. Between May 2007 and May 2011, IT jobs grew by 6.8%, contributing \$37 billion to an economy that was otherwise stagnant (Atkinson, R. and Stewart, L., 2013).

The future pace of IT job openings is also expected to exceed the norm. BLS projects that computer and mathematical jobs will be one of the top ten fastest growing occupational groups from 2010 to 2020, and that one out of every two STEM (science, technology, engineering and math) jobs will be in computing by 2020 (Computing in the Core, 2013).

The Middle-Skill Employment Gap

The growth in computer occupations, and the rapid pace of new skill requirements in IT is so robust, in fact, that the supply of skilled workers does not appear to be keeping pace with employer demand. This gap takes on two forms – lack of appropriate skill levels among existing workers, and a shortage in the number of new graduates with appropriate IT skills.

A 2012 study conducted by CompTIA found that 93% of business managers involved in oversight of IT functions believe there is an IT skills gap. This translates to over 15 million U.S. businesses that rate the aggregate level of their IT staff skills as less than optimal. Additionally, 42% of managers reported that IT skills gaps are on the rise, compared to 29% reporting that the gap is declining. Finally, 30% of managers report that skills gaps are more prevalent in IT than in other functional areas such as marketing, finance and operations (CompTIA, 2012).

If current graduation rates continue, only 61% of IT jobs through 2018 could be filled by U.S. computing degree-earners. When including only computing bachelor's degrees, this percentage drops to 29% of projected job openings that could be filled (NCWIT, 2013).

An Emerging Career Pathway

Historically, computer support technician occupations have been the focus of discussions and literature about middle-skill computer jobs. These occupations include Computer Network Support Specialists (15-1152) and Computer User Support Specialists (15-1151). For example, the U.S. Bureau of Labor Statistics Occupational Outlook Handbook 2012-2013 shows that this group of computer occupations is the only group with a minimum education requirement of less than a bachelor's degree (BLS, 2013b).

In this report, we set out to challenge the popular assumption that a four year college degree is needed to enter a defined set of IT occupations. We examine an emerging career pathway – IT jobs requiring middle-skill – represented by the entry-level portion of what are typically thought of as high-skill IT occupations. We then explore the skill requirements and opportunities for the community college to be a strategic partner in the development of a workforce capable of participating in four additional career pathways, and assess the employment economics of this scenario.

RESEARCH SOURCES

Data sources and techniques used for this report were validated by numerous national research organizations including the Council for Community and Economic Research and Jobs for the Future. The following is a brief description of these data sources. A complete discussion is provided in the *Research Methodology* section.

Monster Government Solutions (MGS) has served as the lead researcher on this project since its start in 2012. For this report, MGS developed the research approach and methodology, selected and coordinated the various project contributors, analyzed job postings data, and provided analysis and writing for the narrative.

Chmura Economics and Analytics used their proprietary labor analytics tool, JobsEQ®, and modeled economic data on current and projected employment to assess the adequacy of the workforce projections for the number of graduates in each of the occupations and geographies in this report. Economists, from this firm, estimated the average middle-skill wage data.

WANTED Technologies data mined a national set of job postings aligned with the occupations of interest from a 12-month period, filtering for an inferred level of work experience of five years or less.

Peoplebrite used its multi-tenant SaaS Business Intelligence tool to translate unstructured job descriptions into detailed employer requirements inventories. The nearly 80,000 job postings from WANTED were run through Peoplebrite’s analytic engine, resulting in the lists of high-level Skills, Knowledge and Competencies and mid-level Detailed Work Activities.

Additionally, the nearly 80,000 job postings were analyzed using Monster’s 6Sense (™) Intelligent Search and SeeMore ® Talent Dashboard. The list of skills produced by the Talent Dashboard were then coded to yield the group of Technical and Specialized Skills that are found in the report.

Finally, Morris, Lloyd & Associates analyzed data from the U.S. Department of Labor and literature reviews to provide macro-level data and context to the occupation-specific data from the other research sources.

Monster Government Systems
Chmura
Economics and Analysis.
Wanted Technologies
PeopleBrite
Morris, Lloyd & Associates

Key Metrics

5-Year Projected Openings is the number of job openings due to replacement and net employment growth for the period from 2014 to 2019.

Annual Growth Rate is the annual job openings due to replacement and net employment growth for the period from 2014 to 2019.

Frequency Score is the percent of occurrences of a given competency within a group of job postings.

Employment Concentration is the occupation's share of a metro area's employment (on a percentage basis) relative to the same occupation's share on a national basis. For example,

- a. a negative employment concentration, for example -50%, indicates that the occupation's share of employment, in a given metro area, is only half of the same occupation's share of employment on a national level;
- b. a positive employment concentration, for example +25%, indicates that a given occupation accounts for a larger share of jobs (on a percentage basis) than the same occupation's share of employment on a national level, and therefore the metro area can lay claim to regional specialty as compared to the rest of the country.

Middle-Skill Employment is the portion of total employment that requires some college experience without requiring a bachelor's degree.

Gap Index is an analysis of the alignment, within a given metro area, between (a) the forecasted demand for a particular occupation and (b) the forecasted supply of graduates with appropriate education and training. The index projects the extent to which the workforce demand will be

- a. adequately served: workforce demand is forecasted to be satisfied by the forecasted rate of new graduates;
- b. slightly underserved: workforce demand will not be satisfied, and less than 25% of the estimated shortfall is for middle skill occupations;
- c. modestly underserved: workforce demand will not be satisfied, and between 25% and 50% of the estimated shortfall is for middle skill occupations;
- d. significantly underserved: workforce demand will not be satisfied, and more than 50% of the estimated shortfall is for middle skill occupations.

Geographies Studied

This study analyzed the employment gap both nationally and in each of four metropolitan statistical areas (Boston, Chicago, Las Vegas and San Francisco)

For the purpose of this report,

- the Boston metro area includes these principal cities in the state of Massachusetts: Boston, Cambridge, Framingham, Newton, Quincy and Waltham
- the Chicago metro area includes these principal cities in the state of Illinois: Arlington Heights, Chicago, Del Plaines, Elgin, Evanston, Hoffman Estates, Joliet, Naperville, Schaumburg and Skokie. It also includes Gary, Indiana.
- the Las Vegas metro area includes these principal cities in the state of Nevada: Las Vegas and Paradise
- the San Francisco metro area includes these principal cities in the state of California: Berkeley, Fremont, Hayward, Oakland, Pleasanton, Redwood City, San Francisco, San Leandro, San Mateo, San Rafael, South San Francisco and Walnut Creek.

PROFILES OF SPECIFIC OCCUPATIONS

Historically, computer support occupations have been the focus of discussions and literature about middle-skill computer jobs. These occupations include Computer Network Support Specialists (15-1152) and Computer User Support Specialists (15-1151).

Substantial evidence already exists that there are large employment opportunities for middle-skill workers in the Computer Support Specialist Cluster. For example, the U.S. Bureau of Labor Statistics Occupational Outlook Handbook 2012-2013 shows that this group of computer occupations is the only group with a minimum education requirement of less than a bachelor's degree (BLS, 2013b).

Occupations selected for this report...

Computer Systems Analyst

Medical Records and Health Information Technicians

Web Developer

Big Data Cluster

Key national statistics from BLS for this cluster are as follows:

- 2012 employment of over 693,000
- Projected employment in 2020 of over 717,000
- Projected job openings from 2010-2020 of over 269,500

Therefore, the focus of this report is on characterizing the recent and projected demand for the “middle-skill” components of a selected group of occupations for the U.S. and for four metro areas—Boston (including Cambridge & Quincy), Chicago (including Naperville & Joliet, Las Vegas (including Paradise), and San Francisco (including Oakland & Fremont).

Occupations were selected for this report based on the following considerations:

- occupations were included that had the highest current and projected employment volume;
- occupations were included that had a middle-skill employment count that was at least 15% of the total employment count for that occupation;
- the occupation, Medical Records and Health Information Technicians, did not meet either of these criteria, but was selected based on industry input.

The occupations studied are listed, below, in order of the largest current national middle-skill employment:

- Computer Systems Analysts (15-1121)
- Medical Records and Health Information Technicians (29-2071)
- Web Developers (15-1134)
- Big Data Cluster
defined as Database Administrators (15-1141), Data Warehousing Specialists (15-1199.07), and Business Intelligence Analysts (15-1199.08)

While the “Big Data Cluster” is not well covered by BLS per se, it is an emerging demand category that is receiving attention by educators and employers as an area of future talent development and shortage. The Monster and BATEC research teams used an iterative process, including review of employment and job posting data, to narrow the occupations to those in the cluster.

For each of the four occupational groups and geographies, we provide current employment data, growth projections through 2019, quantify the demand for the middle-skill component, and create detailed employer demand profiles for this component.

Job Profile: Computer Systems Analyst

- Computer Systems Analysts is by far the occupation with the largest national employment of the four occupations.
- In absolute terms, the number of middle-skill jobs in this occupation is larger than each of the other occupations studied.
- The unemployment rate in this occupation is very low compared to the national average for all occupations, and also the lowest of all of the occupations studied.
- Annual wages for Computer Systems Analysts are well above the average for all occupations, and also the highest of all of the occupational groups studied.¹
- Each of the four metros studied has a high employment concentration and therefore a regional specialty in Computer System Analysts.
- This job profile has a very consistent set of requirements, equally balanced between technical and professional skills.

Computer Systems Analyst

*100,600 Job Openings
(5 Year Projection)*

*Largest Opportunity for
Middle-Skill Employment*

*Significant Workforce
Shortfall projected for
Boston, Chicago, and San
Francisco*

	All Skill Levels				Middle-Skill		
	Employment	Employment Con- centration	Average Annual Wages	Un Employment Rate	Middle Skill Employment	% of Total.	Average Annual Wages
U.S.	508,377	----	\$82,300	3.2%	132,978	26%	\$59,600
Boston	14,422	+ 55%	\$113,700	2.7%	2,061	14%	\$82,300
Chicago	16,930	+ 55%	\$72,700	4.4%	3,458	20%	\$52,600
Las Vegas	1,777	+ 55%	\$82,300	4.0%	513	29%	\$59,600
San Francisco	13,592	+ 75%	\$96,900	3.1%	2,065	15%	\$70,200

Source: Chmura Economics & Analytics JobsEQ ®

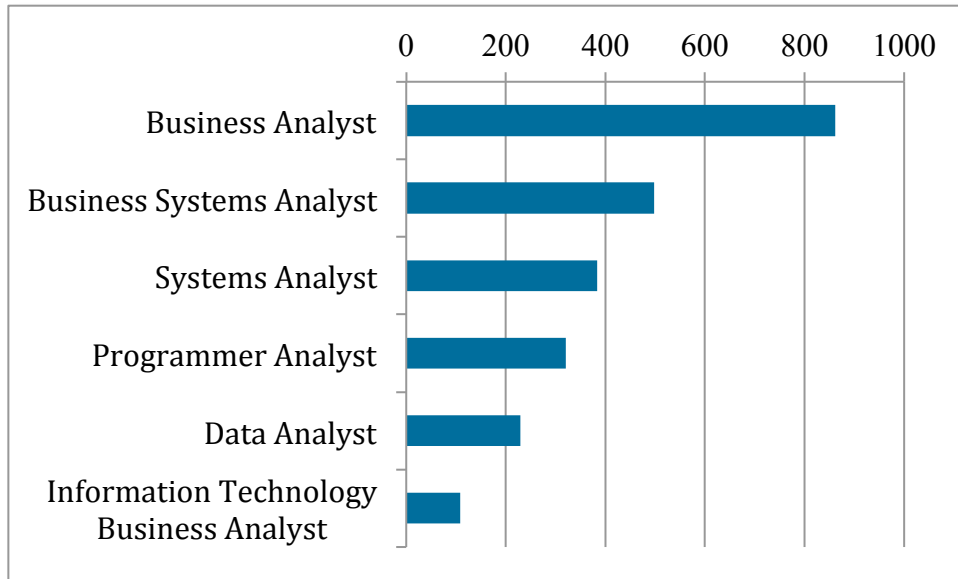
¹ Computer Systems Analysts wages are higher than the Big Data Cluster average. However, for one component of the Big Data Cluster, Business Intelligence Analysts, wages are significantly higher than Computer Systems Analysts.

Sample Job Description

Description (abbreviated)
<p>Title: Business Systems Analyst</p> <p>Responsibilities: Works as part of the IT Applications team to determine how technology can best be used to enable or enhance business processes. Supports research, and recommends and assists in development of emerging technologies as they relate to best practices. Works together with IT Infrastructure and business departments to identify, develop and implement new technologies.</p>
Requirements
<ul style="list-style-type: none">• Minimum of a two-year accounting, business, marketing or IS/computer science degree preferred or the equivalent in work experience.• Previous experience with accounts payable and receivable processing, sales, marketing, customer service, shipping and receiving, wholesale distribution, electronic data interchange (EDI), system/business analyst and/or SAP enterprise resource planning software helpful.• Excellent interpersonal, written and verbal communication, and customer service skills are preferred with the ability to effectively plan, organize and prioritize.• Ability to read, write and speak English preferred.• Prefer good working knowledge of PC for Windows, Microsoft Office (Word, Excel, Access and PowerPoint), Internet and email. <p>Excellent customer service skills include being courteous, responsive, accurate and competent.</p>

Source: *WANTED Technologies*

The U.S. Department of Labor Standard Occupational Code for *Computer Systems Analysts* is (15-1121). There were 6 closely matching job titles for which 100 or more job postings were found.



Source: Monster Government Solutions. Based on analysis of job postings from WANTED Technologies.

There are twelve Knowledge, and twenty-two Skills requirements that have a frequency score of 100 for jobs as *Computer Systems Analysts*. Additionally, we provide the top ten competencies for this occupation.

Primary Knowledge	Primary Skills	Competencies
<ul style="list-style-type: none"> • Education and Training • English Language • Administration and Management • Customer and Personal Service • Mathematics • Clerical • Computers and Electronics • Communications and Media • Personnel and Human Resources • Telecommunications • Law and Government • Sales and Marketing 	<ul style="list-style-type: none"> • Reading Comprehension • Active Learning • Negotiation • Monitoring • Service Orientation • Persuasion • Active Listening • Critical Thinking • Coordination • Complex Problem Solving • Speaking • Judgment and Decision Making • Time Management • Social Perceptiveness • Writing • Systems Evaluation • Learning Strategies • Instructing • Management of Personnel Resources • Systems Analysis • Mathematics • Operations Analysis 	<ul style="list-style-type: none"> • Technology and Tool Usage • Written Communication • Information Gathering • Oral Communication • Following Directions • Attention to Detail • Organization • Thoughtful Reflection • Numerical and Arithmetic Application • Leadership

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Computer Systems Analysts jobs involve emphasis on the management and communication of data, and project management techniques.

Top Detailed Work Activities	Score
Communicate technical information	100
Use spreadsheet software	83
Use computers to enter, access or retrieve data	80
Develop records management system	69
Prepare technical reports or related documentation	69
Conduct training for personnel	67
Use interpersonal communication techniques	66
Use interviewing procedures	65
Use project management techniques	65
Follow data security procedures	65
Follow data storage procedures	65
Test computer programs or systems	65
Evaluate computer system user requests or requirements	65
Program computers using existing software	64
Use relational database software	64
Analyze workflow	63
Adjust computer operation system	63
Develop tables depicting data	62
Use knowledge of mainframe computers	62
Develop or maintain databases	62

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Computer Systems Analysts must be able to program and test computer systems, and organize and communicate information about these systems. The top detailed work activities are categorized here, associated with each of the top five competencies.

Top Competencies	Top Associated Detailed Work Activities
Technology and Tool Usage	Use computers to enter, access or retrieve data Test computer programs or systems Program computers using existing software Use relational database software
Thoughtful Reflection	Develop records management system Analyze workflow Develop tables depicting data Recommend software or hardware purchases Prepare workflow chart
Oral Communication	Communicate technical information Use interpersonal communication techniques Use interviewing procedures Confer with management or users Make presentations
Written Communication	Prepare technical reports or related documentation
Numerical and Arithmetic Application	Create mathematical or statistical diagrams or charts

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Computer Systems Analysts must be proficient in database programming language. They must also be proficient in a variety of software programs, with an emphasis on Microsoft Office applications, and database management programs.

Top Specialized and Technical Skills	Count
SQL (Structured Query Language) (ISQL) (WISQL)	4,628
Microsoft Excel	4,087
Business Software	3,727
Microsoft Word	3,178
Software Development Lifecycle (SDLC)	2,981
Microsoft Office	2,631
Microsoft PowerPoint	2,500
Oracle	2,211
SAP	2,073
Microsoft SQL Server	1,951
Java	1,883
Microsoft Outlook	1,759
Relational Databases (RDBMS)	1,722
Oracle Database	1,505
Microsoft Visio	1,477
Microsoft Access Database	1,385
Scripting (Scripting Languages)	1,305
XML (EXtensible Markup Language)	1,271
Microsoft Product Family	1,175

Source: Analysis of job postings from WANTED Technologies using Monster's 6Sense (™) Intelligent Search and SeeMore ® Talent Dashboard .

Middle-skill Gap Analysis

Nationally, the five year forecast for Computer Systems Analysts is 100,600 job openings, of which 24,100 are forecasted to be middle-skill jobs. This represents the largest number of job opening forecasted for the occupations studied in this report.

Analysis of the data for this occupation begins to suggest a pattern – the national data cannot be used to gauge regional supply and demand characteristics. The two-year education pathway opportunity is regional.

The regional demand for Computer Systems Analysts in Boston, Chicago, and San Francisco is predicted to be significantly underserved by the forecasted rate of graduates, while the regional demand for Computer Systems Analysts in Las Vegas is predicted to be adequately served.

	All Skill Levels		Middle-Skill		
	5-Year Projected Openings	Annual Growth Rate	5-Year Projected Openings	Annual Growth Rate	Gap Index
U.S.	100,610	2.1%	24,107	1.8%	Adequately Served
Boston	2,816	2.0%	362	1.7%	Significantly Underserved
Chicago	3,032	1.8%	569	1.5%	Significantly Underserved
Las Vegas	481	3.3%	129	3.0%	Adequately Served
San Francisco	2,930	2.4%	409	2.1%	Significantly Underserved

Source: Chmura Economics & Analytics JobsEQ[®]

Job Profile: Medical Records & Health IT

- Medical Records and Health Information Technicians is the occupation with the second largest current national employment of the four occupations.
- In absolute terms, the number of middle-skill jobs in this occupation is much larger than either Web Developers or the Big Data Cluster.
- The unemployment rate in this occupation is slightly lower compared to the national average for all occupations, but highest of all of the occupations studied.
- Annual wages for Medical Records and Health Information Technicians are the lowest of all of the occupations studied.
- This job profile has a very consistent set of requirements, equally balanced between technical and professional skills.
- Two of the metros studied, Boston and Chicago, has a high employment concentration, and therefore a regional specialty in Medical Records and Health IT.

	All Skill Levels				Middle-Skill		
	Employment	Employment Concentration	Average Annual Wages	Un Employment Rate	Middle Skill Employment	% of Total.	Average Annual Wages
U.S.	184,209	----	\$35,900	7.3%	96,120	52%	\$35,200
Boston	3,906	+ 16%	\$49,400	5.8%	1,708	44%	\$48,400
Chicago	5,515	+ 16%	\$36,600	9.2%	2,770	50%	\$35,900
Las Vegas	730	- 36%	\$35,900	7.6%	390	53%	\$35,200
San Francisco	2,619	- 7%	\$45,400	7.1%	1,272	49%	\$44,500

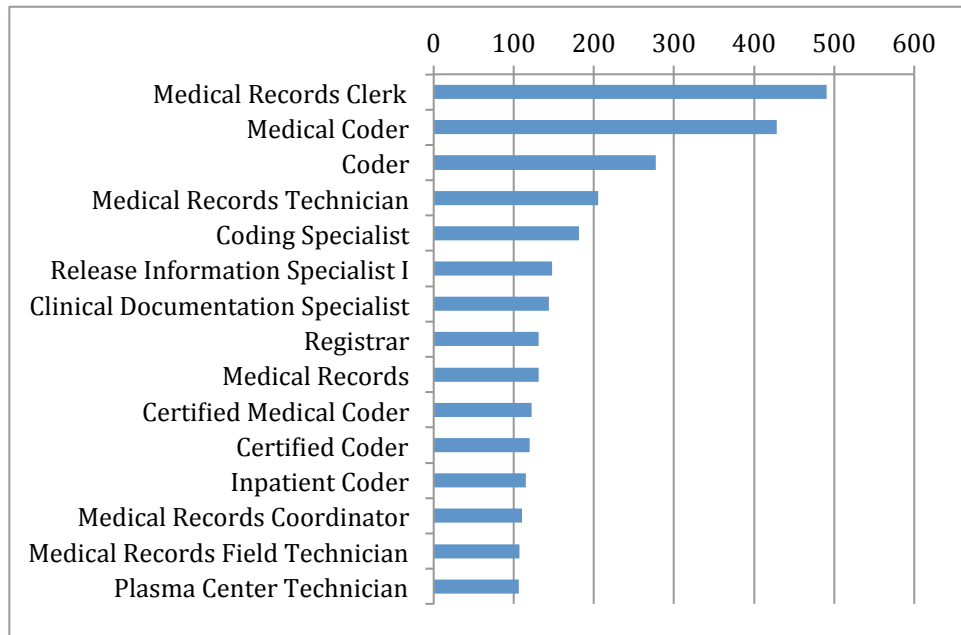
Source: Chmura Economics & Analytics JobsEQ®

Sample Job Description

Description
<p>Title: Business HIS Tech Job</p> <p>Responsibilities: Compile, process, and maintain medical records of hospital and clinic patients in a manner consistent with medical, administrative, ethical, legal, and regulatory requirements of the health care system. Process, maintain, compile, and report patient information for health requirements and standards.</p>
Requirements
<ul style="list-style-type: none">• Education: High School Diploma or GED required.• Post-secondary education in an Allied Health program is preferred• Experience: Two years health information management or post-secondary education with one year experience.• Medical terminology with intermediate PC skills (data entry, word processing, and spreadsheet) required.• Two years' experience dealing with public in person and/or phone required.• Physical Requirements: Requires frequent computer entry, standing, walking, kneeling, stooping, and reaching; regular lifting and/or pushing.• Talking, hearing and CRT skills are required over two-thirds of the time. Manual dexterity to locate and order records via CRT.

Source: WANTED Technologies.

The U.S. Department of Labor Standard Occupational Code for *Medical Records and Health Information Technicians* is 29-2071. There were 15 closely matching job titles for this occupation for which 100 or more job postings were found.



Source: Monster Government Solutions. Based on analysis of job postings from WANTED Technologies.

There are eleven Knowledge, and twenty-one Skills requirements that have a frequency score of 100 for jobs as *Medical Records and Health Information Technicians*. Additionally, we provide the top ten competencies for this occupation.

Primary Knowledge	Primary Skills	Competencies
<ul style="list-style-type: none"> • Mathematics • Education and Training • English Language • Clerical • Administration and Management • Customer and Personal Service • Computers and Electronics • Personnel and Human Resources • Telecommunications • Communications and Media • Law and Government 	<ul style="list-style-type: none"> • Active Learning • Writing • Speaking • Critical Thinking • Persuasion • Coordination • Reading Comprehension • Monitoring • Social Perceptiveness • Negotiation • Active Listening • Service Orientation • Judgment and Decision Making • Management of Personnel Resources • Complex Problem Solving • Time Management • Learning Strategies • Systems Evaluation • Systems Analysis • Instructing • Mathematics 	<ul style="list-style-type: none"> • Technology and Tool Usage • Written Communication • Information Gathering • Oral Communication • Following Directions • Attention to Detail • Organization • Thoughtful Reflection • Numerical and Arithmetic Application • Leadership

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Medical Records and Health Information Technicians jobs involve emphasis on collecting and entering information, and using the information to prepare reports and forms.

Top Detailed Work Activities	Score
Use computers to enter, access or retrieve data	100
Use interviewing procedures	89
Use spreadsheet software	87
Use word processing or desktop publishing software	87
Use oral or written communication techniques	87
Process medical records	85
Fill out business or government forms	83
Examine documents for completeness, accuracy, or conformance to	82
Maintain dental or medical records	82
Obtain information from individuals	82
Prepare reports	81
Use knowledge of medical terminology	81
Use secretarial procedures	79
Use relational database software	78
Understand technical operating, service or repair manuals	78
Transcribe spoken or written information	77
Record medical history or data	77
Create mathematical or statistical diagrams or charts	74
Follow data storage procedures	73
Collect statistical data	71

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Medical Records and Health Information Technicians must be able to gather information, use computers, understand medical codes, and follow detailed directions. The top detailed work activities are categorized here, associated with each of the top five competencies.

Top Competencies	Top Associated Detailed Work Activities
Technology and Tool Usage	Use computers to enter, access or retrieve data Use word processing or desktop publishing software Use spreadsheet software Use relational database software Code data from records
Information Gathering	Obtain information from individuals Collect statistical data
Oral Communication	Use interviewing procedures Use oral or written communication techniques
Following Directions	Follow data storage procedures
Attention to Detail	Examine documents for completeness, accuracy, or conformance to standards Review records for completeness

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Medical Records and Health Information Technicians must be proficient in medical terminology and regulations. They must also be proficient in Microsoft Office applications.

Top Specialized and Technical Skills	Count
Medical Records	10,482
Medical Terminology	5,324
ICD-9	4,351
Microsoft Excel	3,773
Microsoft Word	3,590
Current Procedural Terminology (CPT)	3,366
ICD-9-CM	2,964
Medical Billing	2,528
Medical Coding	2,482
Diagnosis-Related Group (DRG)	2,108
HIPAA (Health Insurance Portability and Accountability Act)	2,069
Healthcare Common Procedure Coding System (HCPCS)	2,061
Microsoft Office	1,943
Microsoft PowerPoint	1,864
Electronic Medical Records	1,838
Microsoft Outlook	1,815
Regulatory Compliance	1,641
State Laws and Regulations	1,532
Federal Laws and Regulations	1,472

Source: Analysis of job postings from WANTED Technologies using Monster's 6Sense (™) Intelligent Search and SeeMore ® Talent Dashboard.

Middle-Skill Gap Analysis

Nationally, the five year forecast for Medical Records and Health Information Technicians is expected to have 36,300 job openings, of which 19,800 are forecasted to be middle-skill jobs. This represents the second largest number of job opening forecasted for the occupations studied in this report.

The demand for Medical Records and Health Information Technicians is strong and is forecasted to remain strong, however, the demand is predicted to be adequately served by the forecasted rate of graduates.

It is also worth noting that the unemployment rates for persons with training in this position is the highest for occupations studied in this report. Subsequent studies could explore the possibility for certificate programs aimed at retraining a displaced workforce.

	All Skill Levels		Middle-Skill		
	5-Year Projected Openings	Annual Growth Rate	5-Year Projected Openings	Annual Growth Rate	Gap Index
U.S.	36,352	2.0%	19,818	2.1%	Adequately Served
Boston	698	1.6%	314	1.7%	Adequately Served
Chicago	965	1.6%	509	1.7%	Adequately Served
Las Vegas	209	3.5%	115	3.6%	Adequately Served
San Francisco	479	1.7%	241	1.8%	Adequately Served

Source: Chmura Economics & Analytics JobsEQ ®

Job Profile: Web Developers

- Web Developers is the occupation with the smallest current national employment of the four occupations.
- In absolute terms, the number of middle-skill jobs in this occupation is slightly larger than the Big Data Cluster.
- The unemployment rate in this occupation is considerably lower than the national average for all occupations, and the second lowest of all of the occupations studied.
- Annual wages for Web Developers are the second lowest of all of the occupations studied.
- Two of the studied metros, Boston and San Francisco, has a high employment concentration and therefore a regional specialty in Web Development.

Web Developers

*17,977 Job Openings
(5 Year Projection)*

*Modest Opportunity for
Middle-skill Employment in
Boston and San Francisco*

*Significant Workforce
Shortfall projected for
Boston, and Las Vegas*

	All Skill Levels				Middle-Skill		
	Employment	Employment Con- centration	Average Annual Wages	Un Employment Rate	Middle Skill Employment	% of Total.	Average Annual Wages
U.S.	101,405	----	\$64,879	3.3%	33,946	33%	\$47,000
Boston	3,821	+ 107%	\$86,475	2.8%	764	20%	\$62,600
Chicago	2,168	- 33%	\$61,195	4.5%	589	27%	\$44,300
Las Vegas	506	- 33%	\$53,202	4.0%	183	36%	\$38,500
San Francisco	3,640	+ 135%	\$81,858	3.1%	768	21%	\$59,300

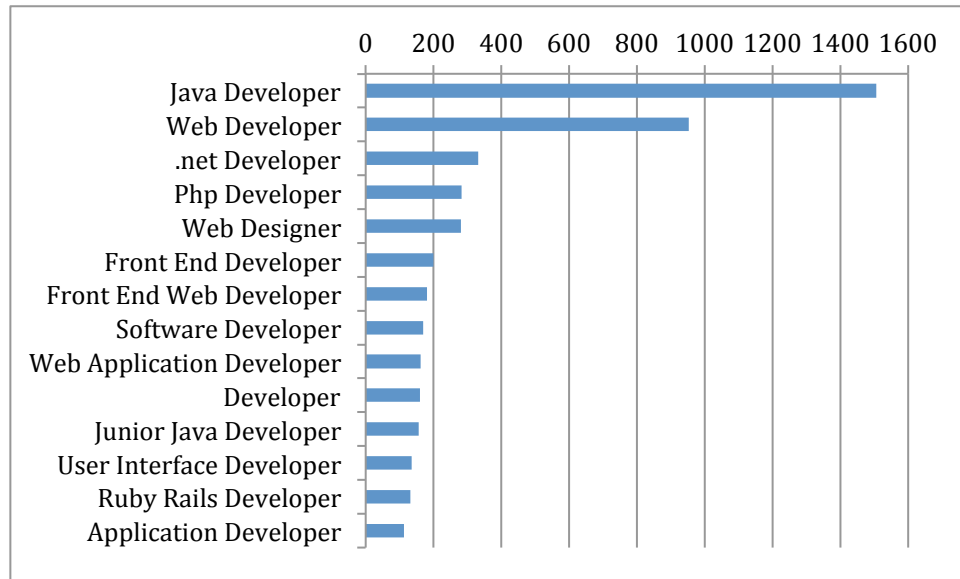
Source: Chmura Economics & Analytics JobsEQ ®

Sample Job Description

Description
<p>Title: Web Design Technician</p> <p>Responsibilities: The Web Design Technician provides technical and operations support for Web services in the NDSU Libraries; maintains, develops and customizes the Libraries website and other digital initiatives; participates in training staff and users; and produces instructional materials, including video, graphics, animations, and interactive media elements to support information literacy programs. The Web Design Technician also performs other duties as assigned</p>
Requirements
<ul style="list-style-type: none">• Minimum Qualifications: Related Associate s degree or the equivalent• Proficient use/operation of computer software/hardware• Interpersonal/oral/written communication skills• Detail oriented• Customer service orientation• Good oral, written and interpersonal communication skills• Preferred Qualifications: 1-2 years' experience with web design and development• Familiarity of library operations <p>Experience with HTML, CSS, JavaScript, and other relevant technologies</p>

Source: WANTED Technologies.

There were 14 closely matching job titles for *Web Developers* for which 100 or more job postings were found.



Source: Monster Government Solutions. Based on analysis of job postings from WANTED Technologies.

There are fourteen Knowledge, and twenty-six Skills requirements that have a frequency score of 100 for jobs as *Web Developers*. Additionally, we provide the top ten competencies for this occupation.

Primary Knowledge	Primary Skills	Competencies
<ul style="list-style-type: none"> • Mathematics • Education and Training • Personnel and Human Resources • Customer and Personal Service • Administration and Management • Clerical • English Language • Computers and Electronics • Sales and Marketing • Law and Government • Communications and Media • Telecommunications • Production and Processing • Design • Engineering and Technology 	<ul style="list-style-type: none"> • Learning Strategies • Complex Problem Solving • Service Orientation • Systems Evaluation • Instructing • Critical Thinking • Writing • Active Listening • Speaking • Time Management • Negotiation • Persuasion • Social Perceptiveness • Monitoring • Reading Comprehension • Judgment and Decision Making • Management of Personnel Resources • Active Learning • Systems Analysis • Operations Analysis • Mathematics • Technology Design • Management of Material Resources • Management of Financial Resources • Operation Monitoring • Programming 	<ul style="list-style-type: none"> • Technology and Tool Usage • Thoughtful Reflection • Oral Communication • Numerical and Arithmetic Application • Written Communication • Problem-Solving • Attention to Detail • Leadership • Creativity • Following Directions

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Web Developers jobs involve emphasis on customer interaction, and programming and evaluating computer systems and databases.

Top Detailed Work Activities	Score
Use computers to enter, access or retrieve data	100
Communicate technical information	97
Use spreadsheet software	97
Consult with customers concerning needs	96
Follow data security procedures	96
Test computer programs or systems	96
Evaluate computer system user requests or requirements	96
Follow data storage procedures	95
Adjust computer operation system	95
Use knowledge of mainframe computers	95
Provide technical computer training	95
Write computer software, programs, or code	95
Use project management techniques	95
Develop or maintain databases	95
Develop tables depicting data	95
Prepare technical reports or related documentation	94
Program mainframe computer	94
Recommend software or hardware purchases	94
Revise or correct errors in computer programs, software, or systems	94
Use computer programming language	94

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Web Developers must be able to use computers, organize information, develop mathematic models and equations to process information, and communicate with internal and external parties. The top detailed work activities are categorized here, associated with each of the top five competencies.

Top Competencies	Top Associated Detailed Work Activities
Technology and Tool Usage	Use computers to enter, access or retrieve data Use spreadsheet software Test computer programs or systems Adjust computer operation system Use knowledge of mainframe computers
Thoughtful Reflection	Develop tables depicting data Recommend software or hardware purchases Develop records management system Use structural analysis techniques to analyze Resolve symbolic formulations in data processing
Oral Communication	Communicate technical information Make presentations Use interpersonal communication techniques
Numerical and Arithmetic	Develop computer performance standards Develop mathematical simulation models Encode equations for processing
Written Communication	Prepare technical reports or related Write documentation for computer programming Write technical specifications for computer systems, software or applications

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from Wanted Technologies.

Web Developers must know HTML and Java programming languages, as well as how to create CSS. Other programming languages are also helpful.

Top Specialized and Technical Skills	Count
HTML (HyperText Markup Language)	10,541
JavaScript	10,196
CSS (Cascading Style Sheet)	8,937
Web Programming	8,507
Java	7,374
User Interface/Experience (UI/UX)	5,571
jQuery	5,312
Internet Application	4,589
XML (EXtensible Markup Language)	4,541
PHP Scripting Language (PHP Hypertext Preprocessor)	4,269
AJAX (Asynchronous JavaScript and XML)	4,137
SQL (Structured Query Language) (ISQL) (WISQL)	3,912
Web Services	3,861
Java Platform, Enterprise Edition (Java EE, fka Java 2 Platform)	3,492
Microsoft .NET	2,933
Microsoft C# (C Sharp)	2,917
Information Technology (IT) & Information Systems (IS)	2,803
MySQL	2,787
Adobe Photoshop	2,584

Source: Analysis of job postings from WANTED Technologies using Monster's 6Sense (™) Intelligent Search and SeeMore ® Talent Dashboard

Middle-skill Gap Analysis

Nationally, the five year forecast for Web Developers is 17,900 job openings, of which 5,600 of which are expected to be middle-skill jobs. This represents the smallest overall projected openings, and for middle-skill jobs, for any of the occupations studied in this report.

Despite the smaller number of total openings, the regional demand for Web Developers in Boston and Las Vegas is predicted to be significantly underserved by the forecasted rate of graduates; the regional demand for Computer Systems Analysts in San Francisco is predicted to be moderately underserved.

	All Skill Levels		Middle-Skill		
	5-Year Projected Openings	Annual Growth Rate	5-Year Projected Openings	Annual Growth Rate	Gap Index
U.S.	17,977	2.1%	5,662	1.9%	Adequately Served
Boston	664	2.0%	123	1.8%	Significantly Underserved
Chicago	343	1.7%	85	1.5%	Adequately Served
Las Vegas	125	3.3%	43	3.1%	Significantly Underserved
San Francisco	696	2.3%	137	2.1%	Moderately Underserved

Source: Chmura Economics & Analytics JobsEQ ®

Job Profile: Big Data Cluster

- The Big Data Cluster includes three occupations – Database Administrators, Data Warehousing Specialists, and Business Intelligence Analysts.
- Database Administrators comprises 86% of employment in the cluster.
- Business Intelligence Analysts have the highest wages in the cluster, and the highest among all occupations studied.
- The Big Data Cluster has the lowest number of middle-skill jobs of the four occupations studied.
- The unemployment rate in this occupation is considerably lower than the national average for all occupations, and the third lowest of all of the occupations studied.
- Annual wages for the Big Data Cluster are the second highest of all of the occupations studied.
- All of the four metros studied has a high employment concentration and therefore a regional specialty in Big Data.

Big Data Cluster

Entry Level Jobs

Database Administrators

Data Warehousing Specialists

Business Intelligence Analysts

24,107 Job Openings

(5 Year Projection)

Emerging Field with

Near Zero Unemployment

Significant Workforce Shortfall

projected for Boston, Chicago, and San Francisco

	All Skill Levels				Middle-Skill		
	Employment	Employment Con- centration	Average Annual Wages	Un Employment Rate	Middle Skill Employment	% of Total.	Average Annual Wages
U.S.	129,609	----	\$79,086	3.4%	33,236	26%	\$57,223
Boston	3,472	+ 47%	\$110,007	2.8%	482	14%	\$79,649
Chicago	4,402	+ 47%	\$82,504	4.6%	876	20%	\$59,768
Las Vegas	505	+ 47%	\$78,853	4.1%	144	28%	\$57,098
San Francisco	3,143	+ 59%	\$92,153	3.2%	463	15%	\$66,693

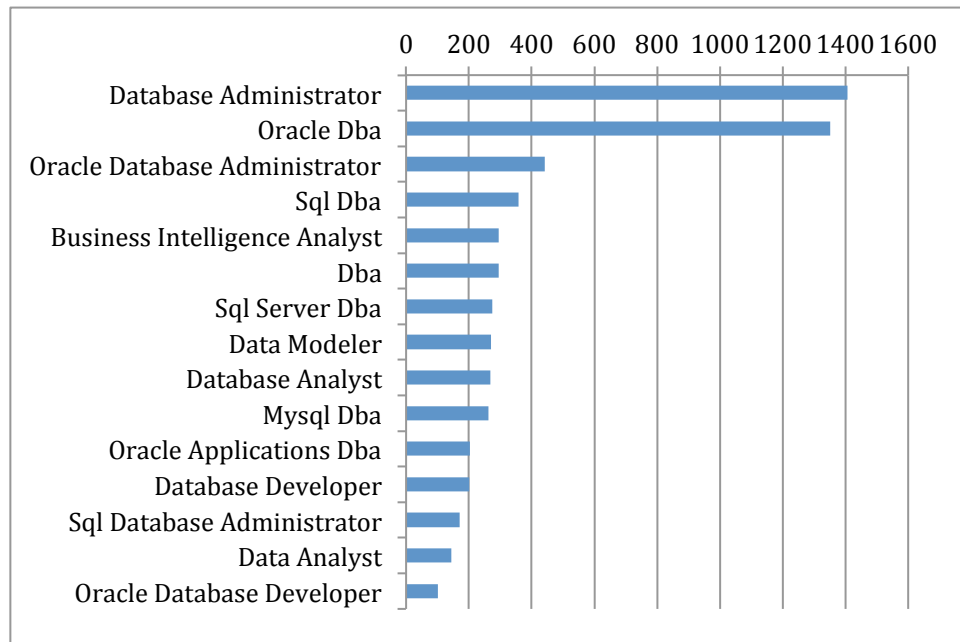
Source: Chmura Economics & Analytics JobsEQ ®

Sample Job Description

Description
<p>Title: Data Analyst</p> <p>Responsibilities (Summary): Responsible for enhancements and maintenance of the Sales Trak database utilizing the web interface and SQL scripting.</p> <p>Essential Duties and Responsibilities:</p> <ul style="list-style-type: none">• Requirement gathering of essential information.• Analysis of viability of modification request.• Generate queries to modify/insert using SQL language.• Responsible for location specific data modification.• Create/develop corporate level database projects for store level tasks.• Perform scheduled and daily reporting and administrative functions.• Perform organizational (Sales Trak) data maintenance on demand quickly and efficiently.
Requirements
<ul style="list-style-type: none">• Education/Experience: 2 years of college or related work experience• 1 -2 years relational database management experience. 1 year SQL.• Computer Skills: SQL scripting, DTS packages, <p>Language Skills: English is the primary language skill, however, bilingual skills may be required based on business necessity</p>

Source: WANTED Technologies.

There are 15 closely matching job titles for the *Big Data Cluster* for which 100 or more job postings were found.



Source: Monster Government Solutions. Based on analysis of job postings from WANTED Technologies.

There are twelve Knowledge, and twenty-three Skills requirements that have a frequency score of 100 for jobs in the *Big Data* Cluster. Additionally, we provide the top ten competencies for this occupation.

Primary Knowledge	Primary Skills	Competencies
<ul style="list-style-type: none"> • Education and Training • Administration and Management • Customer and Personal Service • English Language • Mathematics • Clerical • Communications and Media • Computers and Electronics • Law and Government • Personnel and Human Resources • Telecommunications • Sales and Marketing 	<ul style="list-style-type: none"> • Critical Thinking • Persuasion • Active Listening • Service Orientation • Learning Strategies • Monitoring • Systems Evaluation • Time Management • Social Perceptiveness • Reading Comprehension • Management of Personnel Resources • Instructing • Judgment and Decision Making • Writing • Speaking • Complex Problem Solving • Coordination • Negotiation • Active Learning • Systems Analysis • Mathematics • Management of Material Resources • Operations Analysis 	<ul style="list-style-type: none"> • Technology and Tool Usage • Thoughtful Reflection • Numerical and Arithmetic Application • Oral Communication • Written Communication • Problem-Solving • Organization • Following Directions • Attention to Detail • Teamwork

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

The Big Data Cluster jobs typically involve management of data, project management, and communications of technical information.

Top Detailed Work Activities	Score
Communicate technical information	100
Use computers to enter, access or retrieve data	100
Use spreadsheet software	99
Develop or maintain databases	96
Develop tables depicting data	95
Follow data security procedures	95
Test computer programs or systems	95
Evaluate computer system user requests or requirements	95
Follow data storage procedures	95
Use project management techniques	94
Adjust computer operation system	94
Use knowledge of mainframe computers	94
Provide technical computer training	94
Write computer software, programs, or code	94
Monitor computer operation	94
Revise or correct errors in computer programs, software, or systems	93
Use computer programming language	93
Use relational database software	93
Program mainframe computer	93
Use interpersonal communication techniques	92

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Big Data Cluster workers must be able to work with computer software and systems, create mathematical models, and communicate information to others. The top detailed work activities are categorized here, associated with each of the top five competencies.

Top Competencies	Top Associated Detailed Work Activities
Technology and Tool Usage	Use computers to enter, access or retrieve data Use spreadsheet software Test computer programs or systems Adjust computer operation system Use knowledge of mainframe computers
Thoughtful Reflection	Develop tables depicting data Develop records management system Use structural analysis techniques to analyze Analyze programs using workflow chart or Plan computer security measures
Numerical and Arithmetic Application	Develop mathematical simulation models Develop computer performance standards Use mathematical or statistical methods to identify Prepare cost estimates Develop or maintain budgeting databases
Oral Communication	Communicate technical information Use interpersonal communication techniques Confer with personnel to discuss security
Written Communication	Write documentation for computer programming Prepare instruction manuals Write administrative procedures services manual

Source: Monster Government Solutions and Peoplebrite. Based on analysis of job postings from WANTED Technologies.

Big Data Cluster workers must be able to work with SQL, and other database program languages, operating systems, and Microsoft Office applications.

Top Specialized and Technical Skills	Count
SQL (Structured Query Language) (ISQL) (WISQL)	7,635
Oracle	6,143
Oracle Database	5,701
Performance Tuning/Optimization	5,346
Microsoft SQL Server	5,344
Oracle DBA (Database Administrator)	4,120
Scripting (Scripting Languages)	3,337
Relational Databases (RDBMS)	3,289
Linux Operating System	3,197
Oracle PL-SQL	3,097
Database Extract, Transform, and Load (ETL)	3,085
Unix Operating Systems	3,021
Unix Shell Programming	2,717
Microsoft Excel	2,218
SQL Databases	2,153
Microsoft Word	2,086
Information/Data Security (INFOSEC)	2,030
MySQL	1,942
Database Management Software/Systems (DBMS)	1,894

Source: Analysis of job postings from WANTED Technologies using Monster's 6Sense (™) Intelligent Search and SeeMore ® Talent Dashboard .

Middle-skill Gap Analysis

Nationally, the five year forecast in Big Data Cluster is 27,400 job openings, of which about 6,400 are expected to be middle-skill jobs. This represents the third largest overall projected openings, and for middle-skill jobs, for any of the occupations studied in this report.

Despite the smaller number of total openings, the regional demand in Big Data in Boston and San Francisco is predicted to be significantly underserved by the forecasted rate of graduates.

	All Skill Levels		Middle-Skill		
	5-Year Projected Openings	Annual Growth Rate	5-Year Projected Openings	Annual Growth Rate	Gap Index
U.S.	27,382	2.5%	6,434	3.5%	*
Boston	737	2.5%	94	2.4%	Significantly Underserved
Chicago	860	2.2%	154	1.9%	Adequately Served
Las Vegas	147	3.8%	39	3.5%	Adequately Served
San Francisco	709	2.7%	96	2.4%	Significantly Underserved

Source: Chmura Economics & Analytics JobsEQ ®

	Boston	Chicago	Las Vegas	San Francisco
Database Administrators	Significantly Underserved	Slightly Underserved	Slightly Underserved	Adequately Served
Data Warehousing Specialists	Adequately Served	Adequately Served	Adequately Served	Significantly Underserved
Business Intelligence Analysts	Adequately Served	Adequately Served	Adequately Served	Significantly Underserved

In Boston, the largest gap index and the greatest opportunity for an increase in the rate of graduates is in Database Administrators. In San Francisco, the largest gap index and the greatest opportunity for an increase in the rate of graduates is in the occupations of Data Warehousing Specialists and Business Intelligence *Analysts*.

METRO-SPECIFIC ANALYSIS

In this section, we quantify current employment and projected growth for the four specific metropolitan statistical areas (MSAs) of interest. Additionally, we used employment projections to help gauge the feasibility of adding associate degree capacity in each metro.

Boston (including Cambridge and Quincy)

- Overall we found robust IT employment in the Boston metro area. Current employment in the Boston metro area, in comparison with other regional areas, was disproportionately higher for all occupations studied. The employment concentration of Web Developers was particularly high.
- The unemployment rate was correspondingly lower in comparison to the other metro areas studied. The rates for each of the IT occupations are below 3%. Anticipated annual growth rates for these occupations for the next five years range from a low of 0.8% (Database Administrators) to a high of 1.6% (Medical Records and Health Information Technicians).
- In the Boston MSA, employment in each of these jobs has increased faster in the past year than in the nation as a whole.
- The data suggest that in each of these occupations the metro area is importing graduates from other metro areas.
- The regional demand, for Computer Systems Analysts, Web Developers and Database Administrators, is predicted to be significantly underserved by the forecasted rate of graduates. There is a regional shortfall of graduates entering the workforce and an opportunity to increase the rate of properly educated graduates aimed at these occupations.
- The regional demand, for Medical Records and Health Information Technicians, Data Warehousing Specialists and Business Intelligence Analysts, is predicted to be adequately served by the forecasted rate of graduates. The regional mix of graduates suggests alignment with the workforce demands.

*Robust IT Employment,
disproportionately higher than
other metros studied*

*Faster employment growth than
the national average*

*Significant opportunity to
increase the rate of graduates
aimed at the occupations of
Computer Systems Analysts,
Web Developers and Database
Administrators*

Current Employment Data (Q1 2013)

	All Skill Levels				Middle-Skill		
	Employment	Employment Concentration	Average Annual Wages	Un Employment Rate	Middle-Skill Employment	% of Total	Average Annual Wages
Medical Records and Health Information Technicians	3,906	+ 16%	\$49,400	5.8%	1,708	44%	\$48,400
Computer Systems Analysts	14,422	+ 55%	\$113,700	2.7%	2,061	14%	\$82,300
Web Developers	3,821	+ 107%	\$86,475	2.8%	764	20%	\$62,600
Big Data	3,472	+ 47%	\$110,007	2.8%	482	14%	\$79,649

Source: Chmura Economics & Analytics JobsEQ ®

Growth Forecast (2014 – 2019)

	Medical Records & Health Information Technicians	Computer Systems Analysts	Web Developers	Big Data
Average Annual Growth, All Skills	1.6%	2.0%	2.0%	2.5%
Average Annual Growth, Middle-Skill	1.7%	1.7%	1.8%	2.4%

Source: Chmura Economic & Analytics JobsEQ ®

Middle-skill Gap Analysis

	Shortfall All Degrees	Annual Supply Gap (or Surplus)	Gap Index
Medical Records and Health Information Technicians	358	42	Adequately Served
Computer Systems Analysts	175	30	Significantly Underserved
Web Developers	87	3	Significantly Underserved
Database Administrators	42	20	Significantly Underserved
Data Warehousing Specialists	1	N.A.	Adequately Served
Business Intelligence Analysts	2	N.A.	Adequately Served

Source: Chmura Economics & Analytics JobsEQ[®]

Chicago (including Naperville and Joliet)

- Employment, for the occupations studied, was highest in the Chicago metro area. Employment concentration was high for most, but not all of the occupations studied. Web Developers was the sole exception.
- While unemployment rates for each of the IT occupations is below 5%, unemployment in Chicago is the highest of all the metro areas studied. Anticipated annual growth rates for these occupations for the next five years range from a low of 0.5% (Data Warehousing Specialists and Business Intelligence Analysts) to a high of 2.4% (Database Administrators).
- In the Chicago MSA, employment in each of the IT jobs shrank in the past year as compared with roughly 0.5% growth in the nation as a whole. In contrast, Medical Records and Health Information Technicians employment increased by 0.9%, which was a slower rate than in the nation.
- The data indicates that a shortage exists for Database Administrators, suggesting that the metro area is importing graduates for this occupation.
- The regional demand, for Computer Systems Analysts, is predicted to be significantly underserved by the forecasted rate of graduates. There is a regional shortfall of graduates entering the workforce and an opportunity to increase the rate of properly educated graduates aimed at these occupations.
- The regional demand, for Database Administrators, is predicted to be slightly underserved by the forecasted rate of graduates. There is a regional shortfall of graduates entering the workforce and an opportunity to increase the rate of properly educated graduates aimed at these occupations.
- The regional demand, for Medical Records and Health Information Technicians, Web Developers, Data Warehousing Specialists and Business Intelligence Analysts, is predicted to be adequately served by the forecasted rate of graduates. The regional mix of graduates suggests alignment with the workforce demands.

Large overall employment in IT, disproportionately higher than the national average.

Unemployment, while under 5%, was higher than other metro areas studied.

Significant opportunity to increase the rate of graduates aimed at the occupation of Computer Systems Analysts.

Slight opportunity to increase the rate of graduates aimed at the occupation of Database Administrator.

Current Employment Data (Q1 2013)

	All Skill Levels				Middle-Skill		
	Employment	Employment Concentration	Average Annual Wages	Un Employment Rate	Middle-Skill Employment	% of Total	Average Annual Wages
Medical Records and Health Information Technicians	5,515	+ 16%	\$36,600	9.2%	2,770	50%	\$35,900
Computer Systems Analysts	16,930	+ 55%	\$72,700	4.4%	3,458	20%	\$52,600
Web Developers	2,168	- 33%	\$61,195	4.5%	589	27%	\$44,300
Big Data Occupational Cluster	4,402	+ 47%	\$82,504	4.6%	876	20%	\$59,768

Source: Chmura Economics & Analytics JobsEQ ®

Growth Forecast (2014 – 2019)

	Medical Records & Health Information Technicians	Computer Systems Analysts	Web Developers	Big Data
Average Annual Growth, All Skills	1.6%	1.8%	1.7%	2.2%
Average Annual Growth, Middle-Skill	1.7%	1.5%	1.5%	1.9%

Source: Chmura Economics & Analytics JobsEQ ®

Middle-Skill Gap Analysis

	Shortfall All Degrees	Annual Supply Gap (or Surplus)	Gap Index
Medical Records and Health Information Technicians	-	42	Adequately Served
Computer Systems Analysts	-	84	Significantly Underserved
Web Developers	-	21	Adequately Served
Database Administrators	92	38	Slightly Underserved
Data Warehousing Specialists	-	N.A.	Adequately Served
Business Intelligence Analysts	-	N.A.	Adequately Served

Source: Chmura Economics & Analytics JobsEQ[®]

Las Vegas (Paradise)

- Employment, for the occupations studied, was lowest in the Las Vegas metro area. Employment concentration was high for most, but not all of the occupations studied. Web Developers was the sole exception.
- While the unemployment rates for each of the IT occupations are below 5%, the unemployment rate was the second highest of all the metro areas studied. Anticipated annual growth rates for these occupations for the next five years range from a low 2.0% (Data Warehousing Specialists and Business Intelligence Analysts) to a high of 4.1% (Database Administrators).
- In the Las Vegas MSA, employment in each of the IT jobs shrank in the past year as compared with roughly 0.5% growth in the nation as a whole. In contrast, Medical Records and Health Information Technicians employment increased by 1.7%, roughly on par with the national trend.
- The regional demand, for Web Developers, is predicted to be significantly underserved by the forecasted rate of graduates. There is a regional shortfall of graduates entering the workforce and an opportunity to increase the rate of properly educated graduates aimed at these occupations.
- The regional demand, for Database Administrators, is predicted to be slightly underserved by the forecasted rate of graduates. There is a regional shortfall of graduates entering the workforce and an opportunity to increase the rate of properly educated graduates aimed at these occupations.
- The regional demand, for Medical Records and Health Information Technicians, Computer Systems Analysts, Data Warehousing Specialists and Business Intelligence Analysts, is predicted to be adequately served by the forecasted rate of graduates. The regional mix of graduates suggests alignment with the workforce demands.

Modest overall employment in IT, disproportionately smaller than the national average.

Unemployment, while under 5%, was relatively higher than other metro areas studied.

Significant opportunity to increase the rate of graduates aimed at the occupation of Web Developer.

Slight opportunity to increase the rate of graduates aimed at the occupation of Database Administrator.

Current Employment Data (Q1 2013)

	All Skill Levels				Middle-Skill		
	Employment	Employment Concentration	Average Annual Wages	Un Employment Rate	Middle-Skill Employment	% of Total	Average Annual Wages
Medical Records and Health Information Technicians	730	+ 16%	\$35,900	7.6%	390	53%	\$35,200
Computer Systems Analysts	1,777	+ 55%	\$82,300	4.0%	513	29%	\$59,600
Web Developers	506	- 33%	\$53,202	4.0%	183	36%	\$38,500
Big Data	505	+ 47%	\$78,853	4.1%	144	28%	\$57,098

Source: Chmura Economics & Analytics JobsEQ ®

Growth Forecast (2014 – 2019)

	Medical Records & Health Information Technicians	Computer Systems Analysts	Web Developers	Big Data
Average Annual Growth, All Skills	3.5%	3.3%	3.3%	3.8%
Average Annual Growth, Middle-skill	3.6%	3.0%	3.1%	3.5%

Source: Chmura Economics & Analytics JobsEQ ®

Middle-Skill Gap Analysis

	Shortfall All Degrees	Annual Supply Gap (or Surplus)	Gap Index
Medical Records and Health Information Technicians	-	10	Adequately Served
Computer Systems Analysts	13	38	Adequately Served
Web Developers	6	18	Significantly Underserved
Database Administrators	14	12	Slightly Underserved
Data Warehousing Specialists	-	N.A.	Adequately Served
Business Intelligence Analysts	-	N.A.	Adequately Served

Source: Chmura Economics & Analytics JobsEQ[®]

San Francisco (including Oakland and Fremont)

- Overall we found the third largest absolute employment in the occupations studied in the San Francisco metro area. Current employment in the San Francisco metro area, in comparison with other regional areas, was disproportionately higher for all occupations studied, with the exception of Medical Records and Health Information Technicians. The employment concentration of Web Developers was particularly high.
- The unemployment rate for each occupation was the second lowest all of the metro areas studied. Unemployment rates for each of the IT occupations are below 3.5%. Anticipated annual growth rates for these occupations for the next five years range from a low 1.0% (Database Warehousing Specialists and Business Intelligence Analysts) to a high of 3.0% (Database Administrators).
- In the San Francisco-Oakland-Fremont MSA, employment in all of the occupations studied has increased faster in the past year than the nation as a whole.
- The data suggest the metro area is importing graduates in Computer System Analysts and Medical Records and Health Information Technicians.
- The regional demand, for Computer Systems Analysts, Data Warehousing Specialist and Business Intelligence Analysts, is predicted to be significantly underserved by the forecasted rate of graduates. There is a regional shortfall of graduates entering the workforce and an opportunity to increase the rate of properly educated graduates aimed at these occupations.
- The regional demand, for Web Developers, is predicted to be moderately underserved by the forecasted rate of graduates. There is a regional shortfall of graduates entering the workforce and an opportunity to increase the rate of properly educated graduates aimed at these occupations.
- The regional demand, for Medical Records and Health Information Technicians, and Database Administrators, is predicted to be adequately served by the forecasted rate of graduates. The regional mix of graduates suggests alignment with the workforce demands.

While only third in overall IT Employment, San Francisco disproportionately higher than other metros studied in three of the four studied occupations

Faster employment growth than the national average

Significant opportunity to increase the rate of graduates aimed at the occupations of Computer Systems Analysts, Data Warehousing Specialists and Business Intelligence Analysts.

Current Employment Data (Q1 2013)

	All Skill Levels				Middle-Skill		
	Employment	Employment Concentration	Average Annual Wages	Unemployment Rate	Middle-Skill Employment	% of Total	Average Annual Wages
Medical Records and Health Information Technicians	2,619	93%	\$45,400	7.1%	1,272	49%	\$44,500
Computer Systems Analysts	13,592	+75%	\$96,900	3.1%	2,065	15%	\$70,200
Web Developers	3,640	+ 135%	\$81,858	3.1%	768	21%	\$59,300
Big Data	3,143	+ 59%	\$92,153	3.2%	463	15%	\$66,693

Source: Chmura Economics & Analytics JobsEQ®

Growth Forecast (2014 – 2019)

	Medical Records & Health Information Technicians	Computer Systems Analysts	Web Developers	Big Data
Average Annual Growth, All Skills	1.7%	2.4%	2.3%	2.7%
Average Annual Growth, Middle-skill	1.8%	2.1%	2.1%	2.4%

Source: Chmura Economics & Analytics JobsEQ®

Middle-Skill Gap Analysis

	Shortfall All Degrees	Annual Supply Gap (or Surplus)	Gap Index
Medical Records and Health Information Technicians	126	35	Adequately Served
Computer Systems Analysts	384	71	Significantly Underserved
Web Developers	190	26	Moderately Underserved
Database Administrators	90	23	Adequately Served
Data Warehousing Specialists	2	N.A.	Significantly Underserved
Business Intelligence Analysts	5	N.A.	Significantly Underserved

Source: Chmura Economics & Analytics JobsEQ[®]

CONCLUSIONS

Nationally, more than 296,000 persons are employed in middle-skill jobs in the occupations studied – or about 32% of total employment for this group of occupations as a whole. The middle-skill portion of employment ranges from 26% to 52% by occupation.

The following side-by-side comparison of the Gap Index for each metro and occupation allows for quick analysis of the relative opportunity for an increase in graduates at the associate degree level.

	Boston	Chicago	Las Vegas	San Francisco
Medical Records and Health IT	Adequately Served	Adequately Served	Adequately Served	Adequately Served
Computer Systems Analysts	Significantly Underserved	Significantly Underserved	Adequately Served	Significantly Underserved
Web Developers	Significantly Underserved	Adequately Served	Significantly Underserved	Moderately Underserved
Database Administrators	Significantly Underserved	Slightly Underserved	Slightly Underserved	Adequately Served
Data Warehousing Specialists	Adequately Served	Adequately Served	Adequately Served	Significantly Underserved
Business Intelligence Analysts	Adequately Served	Adequately Served	Adequately Served	Significantly Underserved

There are clear patterns that emerge from the gap index matrix:

1. There is only slight opportunity to increase the rate of graduates aimed at the occupation of Medical Records and Health Information Technicians above current levels.
2. There are significant opportunities to increase the rate of graduates aimed at the occupations of Computer Systems Analysts, Web Developers, and in the Big Data Cluster. Computer Systems Analysts presents the largest overall opportunity.

3. The demand for the occupations of Computer Systems Analysts and Web Developers is predicted to be significantly underserved in three of the four metro areas studied.
4. The metro areas of San Francisco and Boston present the largest opportunity to increase the rate of graduates in IT fields of study.

Common Specialized and Technical Skills Requirements

An important pattern emerged when we examined the top specialized and technical skills across the occupations studied. There were a number of common technical skills requirements across three of the occupational groups – Computer Systems Analysts, Web Developers and the Big Data Cluster. These include SQL, Oracle Database, XML, Java, Linux and Unix Operating Systems, and Microsoft Office applications.

However, the greatest number of commonalities appeared between the Computer Systems Analysts and Big Data Cluster occupations. In addition to the common skills already mentioned, these two occupational groups possess over a dozen other commonalities, many of which are more specific applications, or sub-applications of those already listed. Additional skills include Microsoft SQL Server, Microsoft .NET, IBM Cognos, Database Extract, Transform, and Load (ETL), and Oracle ERP.

Diversity of Specialized Skills for Web Developers

Another important finding was the sheer number of specialized and technical skills involved with the Web Developers occupation – over one hundred unique skills. This was nearly double each of the other occupational groups. This suggests that there may be a need to research the presence of particular specialties within web development.

Application of the Findings

Use of the modeled economic and education data in this study dovetails with more states turning to this kind of data to help identify and address state and regional market needs, test the feasibility of new academic programs and prepare students for high-paying, high-demand jobs. There are a number of tools and experts available to help with the application of this kind of data to local workforce development planning – a good number of which were involved with the preparation of this report. While this data can benefit a single community college region, additional value may come from application at a state or multi-state level.

This research can help catalyze employer input into shaping higher education direction and curriculum content. The study has the potential to enhance the credibility and expertise of community colleges in the eyes of employers as an ongoing and relevant source of ICT talent, including for entry level positions in high-skill occupations. Similar studies help strengthen employer recruitment and relationships in workforce development, and similar results can occur here. This report can serve as the basis for convening key employers, discussing their entry

level hiring needs and building the case for community colleges as a viable and ongoing talent pipeline for middle-skill talent. The multi-level analysis of job requirements in the report can also help to inform coursework- particularly in relation to foundational courses which may teach a cross-section of hard, soft and technical skills that are applicable across a range of ICT occupations.

Opportunities for Additional Research

Industries and occupations in which information technology is a primary activity are rapidly evolving. Therefore, it is important to periodically revisit this research approach. Additionally, the skills requirements of rapidly changing industries may defy occupational classification, as roles for persons with selected job titles evolve over time. Skill requirements for a person with the same job title will vary from one company to the next; and from one industry to the next. This suggests that further analysis of aggregate skill requirements across groups of occupational titles, groups of companies, and groups of like industries may provide additional value in the planning for curriculum development.

Even where the modeled economic data in this report illustrate limited opportunities for production of more graduates with associate's degrees, there is value in the examination of the skill requirements for the occupation. Medical Records and Health Information Technicians is a good example. While the economic and education data suggest no additional supply of degree awards is needed for this occupation, there is value in the application of data mining to understand and address changing employer requirement to revise curriculum and create a workforce that is more "work ready".

Finally, there are other specific IT occupations, such as Computer Programmer, that exhibit a mid-skills employment base that suggests value in exploring future opportunities with the approach, data and analysis used in this study. This occupation is particularly interesting when viewed as a supporting role and career stepping stone to the high-growth software developer occupations (Software Developer, Applications and Software Developers, Systems Software).

RESEARCH METHODOLOGY

Definitions

Middle-Skill jobs are those that require education and training beyond high school but less than a Bachelor's degree, and secure middle-class earnings (of \$35,000 per year or more). The education and training programs that prepare Americans for these jobs are commonly referred to as career and technical education (or "CTE"). Educational inputs required to obtain middle-skill jobs include post-secondary certificates and associates degrees.

Knowledge is organized sets of principles and facts applying in general domains.

Skills are developed capacities that facilitate learning or the more rapid acquisition of knowledge.

Competencies are applied skills that employers consider necessary for the workplace.

Detailed Work Activities (or DWAs) is a description of work that is performed in roughly the same way across multiple occupations. DWAs are more specific than competencies.

Tools and Specialized Skills are machines, equipment, tools, software, standards, methodologies and information technology workers may use for optimal functioning in a high performance workplace.

Our Approach in Detail

Our approach to development of data for this report relies on several key techniques which have been tested in other labor market analyses. Our techniques include use of public data from the U.S. departments of Labor and Education, coupled with proprietary data analysis.

Research Sources

Monster: Semantic Search and Analytic Engine for Skills Inventory

The nearly 80,000 job descriptions aligned with the occupations of interest were analyzed using Monster's 6Sense (™) Intelligent Search and SeeMore ® Talent Dashboard. Monster's semantic search 6Sense Technology:

- Understands job titles, skills, industries, education etc.
- Understands the hierarchy of concepts
- Taps a huge knowledge base learned from millions of resumes
- Understands synonyms, differentiates words that are spelled the same, prone to spelling errors, or conjugated

The inventory of skills was produced through use of Monster's analytic application, the Talent Dashboard. The list of skills produced by the Talent Dashboard were then coded to yield the group of Technical and Specialized skills that are found in the report.

Chmura Economic and Analytics: Modeled Economic and Education Data

Founded in 1999 and based in Richmond, VA, Chmura Economics and Analytics specializes in applied economic consulting, quantitative research, and software solutions requiring the integration of advanced economic analysis. For this project, data was generated from Chmura's JobsEQ®, a web-based software system that provides access to national economic data and also contains detailed regional data and analysis.

JobsEQ® features current and historic data from nearly 100 established sources including the BLS, BEA, US Census, and numerous state-level employment agencies. For this project, the employment estimates for Data Warehousing Specialist (15-1199.07) and Business Intelligence Analyst (15-1199.08) were produced through a combination job-posting data then validated and compared with internet keyword search volume. Specific trends in NCES data relating to select IT degrees (11.0804) were integrated into our findings and the final data sets were used in combination to compute the final estimates. The average middle-skill wage data was also estimated by Chmura's team of economists.

WANTED Technologies: Job Postings

WANTED provides real-time business intelligence for the talent marketplace and began collecting detailed Hiring Demand data in June 2005. The company currently maintains a database of more than 900 million unique job listings. Data is collected daily from thousands of sources, including job boards and corporate websites. Data is categorized by Standard Occupational Classification (SOC), or by industry (NAICS), location, individual employer and other attributes. A large number of job boards share and re-distribute job postings amongst each other, so the majority of the 10 million postings collected each week are duplicates. WANTED has developed proprietary techniques to remove duplicate listings. The company has developed proprietary techniques to determine which sources of data are the most reliable. For this project, a national set of job postings (from all 50 US states) aligned with the occupations of interest were culled from a 12 month period and were filtered with an inferred level of work experience of five years or less.

PeopleBrite: Analytics for High and Middle-Level Employer Job Requirements

Founded in 2012, PeopleBrite is an on-demand, SaaS, multi-tenant Business Intelligence tool for Human Talent Optimization that uses a new technology around skills. The product provides the capability to translate unstructured resumes, profiles, and lay-job descriptions into detailed skills inventories faster, more precise, easy to use, in a scalable manner and by using a common skills language,

This is made possible via a process that considers both text that is explicitly stated and the meaning of the text. The results from this method and system are a listing of skills at the relevant level which includes both explicit skills and implied skills. In this project, the nearly 80,000 job postings were run through PeopleBrite's analytic engine, which resulted in the lists of high level Skills, Knowledge and Competencies and mid-level Detailed Work Activities (DWA).

Use of Online Job Postings

According to a 2011 study by Jobs for the Future (Alstadt, 2011) "recent research suggests that jobs advertised online now reflect at least 70 percent of all openings." For-profit companies have developed sophisticated technologies that can aggregate and analyze these online job ads and provide "real-time" intelligence on hiring trends for industries and occupations, job requirements (e.g., skills, education, experience, certifications), and compensation (e.g., salary and benefits).

Analyses of online job ads offer several advantages over traditional sources of data and information on hiring trends:

- Aggregating millions of online job ads can provide broad, detailed, and timely information.
- Because much of the process is automated, job ads can be collected and analyzed quickly for a fraction of the cost of other approaches.
- A great deal of information can be extracted from job ads, including in many cases specialized skills and certifications.

With this knowledge, community colleges can access information on local hiring trends and skill requirements. They can keep up with the changing demands of the labor market by incorporating new or emerging skills and certifications into existing curricula while designing and delivering new programs of study. In addition, analyses of online job ads can inform the design of career pathway curricula by identifying common and related skill requirements in job openings representing broad occupational clusters. College counselors can use the information to guide students toward program and course offerings tied to occupations with strong employment and earning potential. More recent studies continue to affirm the utility and widespread use of real-time labor data to align education with market demand (Aspen Institute, 2013 and State of Utah, 2013).

Our approach to use of job postings in this report relies on aggregation by a company called Wanted Technologies – one of the oldest and most respected companies in this market segment. Wanted-derived data underpin the monthly hiring trends reports produced by the Conference Board - a resource that is trusted and followed by economists in the major federal government statistical agencies.

In order to create employer demand profiles for each occupational classification, we used multi-level data mining from Monster, Wanted and PeopleBrite to get at the high level and detailed level requirements that employers provided in job postings. Our job postings data mining involved the following key steps:

- Searched all job postings (for full-time and contract positions) nationwide, from hundreds of online job boards over a 12-month period from May 2012 to 2013 for relevant occupational titles. The nationwide sample included postings from all 50 states.
- Within relevant occupational titles we filtered on those postings requiring an experience level of 5 years or less. We located over 20,000 job postings per occupation.
- From each of the groups of postings by occupation, we ran the job postings through a sophisticated job profiling engine that translated unstructured lay-job descriptions into Knowledge, Skills, Competencies and Detailed Work Activities (DWAs).
- We also ran the postings through a second analytic engine that yielded the detailed list of skills from which the top list of Specialized and Technical Skills were pulled.
- Overall, the results include a ranked summary list for each occupational classification of top Knowledge, Skills, Competencies, DWAs, Specialized and Technical Skills, and related job titles.

The following figure illustrates the hierarchy of organization of employer requirements in our job profiles.



For each of the four occupational classifications we provide a profile that contains all associated employer requirements that is based on a frequency scoring of the percent of occurrences of the associated requirement, as determined by running the data set of job postings through the analytic engines.

In our profiles of each occupation, we present the following number of employer requirements, by type:

- Each of the Knowledge and Skills requirements that received a score of 100
- Top 10 Competencies
- Top 20 DWAs overall
- Top one to five DWAs associated with each of the top five Competencies²
- Top 20 Specialized and Technical Skills

CIP-SOC Crosswalk

One technique that is commonly used to help determine the level of mismatch, or “gap” between supply of new workers and demand for those workers is to create a “crosswalk” between the classifications of instructional programs (CIPs) and standard occupational codes (SOCs). This process is common among individual education institutions and statewide higher education commissions across the U.S. (State of Utah, 2013). For this report, Chmura Economics developed appropriate CIPs for each of our SOCs of interest.

² Only those DWAs that received a frequency score of 50 are listed under their corresponding competencies.

Projecting Occupational Employment Growth

Projecting occupational (SOC) employment growth is a common practice conducted by the U.S. Department of Labor, state and regional workforce development agencies, as well as the human resource functions of mid-to-large scale private companies.

For this report, Chmura Economics & Analytics projected the change in employment for each of the SOCs for the time period from 2014-2019. Chmura's methodology for using labor market data to help determine academic program feasibility blends real time labor market information with modeled economic data. This is due to the fact that the U.S. Department of Labor does not currently provide occupation-specific employment data for Data Warehousing Specialist (15-1199.07) and Business Intelligence Analyst (15-1199.08) had to be imputed in the absence of any government-based metric. Therefore, Chmura applied posting data from Wanted Technologies for the last two years as input to help with projections where BLS data were not available.

Gap Index

Our Gap Index, which was created by Chmura Economics & Analytics, is based on the potential mis-alignment between the share of individuals with a specific degree of educational attainment (assoc./bach./grad) versus the share of those degrees being awarded in the geographic area. For associate degrees the scale is "adequately served", "slightly underserved", "moderately underserved" and "significantly underserved".

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