



ALIGNING COMMUNITY COLLEGES TO THEIR LOCAL LABOR MARKETS

THE EMERGING ROLE OF ONLINE JOB ADS FOR PROVIDING REAL-TIME INTELLIGENCE ABOUT OCCUPATIONS AND SKILLS IN DEMAND

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Credentials that Work seeks to utilize innovations in the collection and use of real-time labor market information to better align investments in education and training with the needs of the economy. Stronger alignment will ensure that education credentials have high value for both workers and employers.

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EXECUTIVE SUMMARY

The U.S. economy will emerge from the Great Recession radically transformed from what it was a generation ago. Changes are afoot affecting which occupations and industry sectors will produce employment growth, as well as what education credentials, competencies, and skills will be required to do those jobs. These enduring shifts in labor market demand will compel laid-off workers to seek retraining for new careers, incumbent employees to upgrade their skills to remain competitive, and today's youth to reach for higher levels of education attainment to ensure a foothold in the middle class.

The rising demand for education and training provides opportunities and also poses challenges for the nation's community colleges. If colleges expect to attract more students and graduate them prepared for sustainable careers, they must better align program offerings and course curricula to the needs of their local labor markets. Decisions on which programs to offer and what to teach in class should correspond to employers' immediate and ongoing demand for workers in a particular occupation or with a specific set of skills.

Community colleges already take steps to address the workforce needs of local employers, but their efforts often are hampered by a lack of detailed, up-to-date information about occupations and skills in demand. A promising, yet still-evolving solution to that problem can be found within the large pool of job openings posted on the Internet. New sophisticated "spidering" and artificial intelligence technologies can aggregate

and analyze these online job ads and provide a more comprehensive, "real-time" source of information about the hiring and skill needs of local employers. If proven accurate and reliable, analyses of online job ads could complement traditional ways that community colleges determine labor market demand for program and course offerings.

A few colleges and states are leading the way in the use of online job ads to gather real-time intelligence about occupation and skill demands. For example, Northeastern states are building a methodology and dataset, based on online job ads, to determine demand for green jobs and skills. New Jersey community colleges are using online jobs as a first step for identifying opportunities to train jobless workers for difficult-to-fill jobs. Meanwhile, Florida's workforce development system is using this intelligence to adjust their lists of education and training programs that qualify for subsidies. Their experiences, documented in this report, demonstrate the possibilities and pitfalls with online job ads as a source of real-time labor market intelligence.

NEW SKILLS FOR A NEW ECONOMY

The United States is undergoing a significant transformation from the industrial economy of the mid-twentieth century to a service- and knowledge-based economy that depends on workers with advanced education and skills. On the one hand, the current recession has accelerated change, eliminating hundreds of thousands of low-skill, blue-collar jobs and swelling the unemployment rolls with workers who have only a high school education or less. On the other hand, economists with the Georgetown University Center on Education and the Workforce suggest that five occupational clusters will drive employment growth and demand for more highly skilled workers as the nation emerges from the economic downturn: managerial and professional office; education; health care professional and technical; scientific, technical, engineering, mathematics, and social sciences (STEM); and community services and arts (Carnevale, Smith, & Strohl 2010).

The Georgetown economists predict that by 2018 nearly two-thirds of all available jobs will require at least some postsecondary education (Carnevale, Smith, & Strohl 2010). That's up from 3 in 10 jobs in 2008 as counted by the U.S. Bureau of Labor Statistics (Lacey & Wright 2010). Job growth is expected to touch occupations requiring postsecondary education: an estimated 30 percent of new jobs will go to workers with some college or a two-year degree (Carnevale, Smith, & Strohl 2010). The creation of jobs requiring an Associate's degree will outpace any other education and training category (Lacey & Wright 2010).

A 2009 survey of the Business Roundtable substantiates the demand for college-educated workers: 65 percent of employers surveyed said that they require an Associate's degree or higher for most positions. Employers cited the greatest need for workers with more technical skills than ever before, higher degrees or certifications, and improved skills or better qualifications (Business Roundtable 2010).

In recognition of the transforming economy and employers' workforce needs, the Obama Administration, along with several states, the Bill & Melinda Gates Foundation, Lumina Foundation for Education, and other private funders, have set ambitious goals for dramatically increasing the number of Americans who earn postsecondary credentials over the next 10 to 15 years (Obama 2010; Bill & Melinda Gates Foundation 2010).¹

In addition, President Obama has called on all Americans to complete at least one year of postsecondary education or training (Obama 2009). The President and private funders have backed up their proclamations with new investments in postsecondary education, with the goal of expanding access and success, particularly in community colleges, long considered a low-cost gateway to a career or an advanced degree.²

The need for higher skills has not been lost on Americans. In the wake of the economy's downturn, enrollment is surging at community colleges: droves of unemployed workers have returned to school seeking retraining, while cash-strapped families are taking advantage of affordable tuition rates (Selingo 2009). Even before the economy

crashed, short-term, noncredit training programs had become popular. They now serve more students than traditional for-credit academic programs on many community colleges campuses (Van Noy et al. 2008).

Mismatch Between School and Work

Yet in the midst of rising ambitions and surging enrollments, there are growing concerns about whether postsecondary education institutions prepare students for skills and careers that are in demand. The media has been awash with personal stories of laid-off workers who have enrolled at community colleges and other education and training institutions only to remain unemployed upon graduation because their career choice or newly acquired skills did not meet the needs of employers (Goodman 2010). The promise of green jobs prodded many community colleges to develop training programs; however, in some areas, few jobs have materialized for graduates (Fletcher 2010). Meanwhile, employers have insisted that they are still struggling to find workers with the right skills (Whitehouse 2010; Motoko 2010). According to the Business Roundtable survey, more than 60 percent of employers reported in July 2009 that they were having difficulty finding qualified applicants to fill current vacancies, even though millions of Americans had lost their jobs in the recession and were searching for work (Business Roundtable 2010).

The mismatch between education offerings and employment opportunities has brought stiff competition for community colleges from proprietary and online training providers. Moreover, in some regions, four-year universities are now serving industries and occupations once dominated by Associate's degree holders: health care employers increasingly consider a Bachelor's degree as the minimum academic qualification for nurses, in particular for those without prior work experience (Jacobs 2011). In the meantime, states are tightening resources and raising accountability standards on community colleges and other postsecondary institutions (State Higher Education Executive Officers 2011; HCM Strategists n.d.).

The bottom line: community colleges are under pressure to produce graduates who can get jobs. But identifying which skills and occupations are in demand is easier said than done.

Difficulties in Identifying Employer Needs

Taking steps to understand business needs is nothing new for community colleges. They commonly review government statistics about employment conditions and long-term occupational projections, as well as government databases tracking the knowledge, skills, and abilities needed to perform hundreds of occupations. Many colleges convene industry advisory groups in an effort to verify skill requirements and get assistance in developing curricula for professional and technical programs. Community colleges also participate in regional sector initiatives, partnering with local businesses, workforce and economic development agencies, and other community organizations to address the skill needs of critical industries. Colleges regularly tie curricula to workplace needs by delivering classroom instruction as part of apprenticeship programs, and they collaborate with individual employers to develop customized training solutions for incumbent workers or new hires.

These strategies can uncover quite a bit about workforce needs, but they have limitations. In general, it is difficult to use government data sets to ascertain current and ongoing demand for specific occupations at the state or local level. Data sets tend to have sample sizes that are too small and dispersed to provide detailed analysis by industry, occupation, or geography. Data are collected too infrequently and released too slowly to offer timely

evidence of labor market changes; in some cases, data may be collected monthly but published quarterly and yearly. Government data sets also present challenges for reflecting the impact of market changes, such as emerging occupations and skills, along with job gains and losses, and they leave out some important information altogether, such as the attainment of certificates (Reamer 2010).

Among the particular concerns:

- > The taxonomies in the Occupational Information Network (O*NET) are updated every seven years, making it difficult to identify emerging skill requirements for occupations in a timely manner (Reamer 2010).
- > The Job Openings and Labor Turnover Survey (JOLTS) and Business Employment Dynamics (BED) lack geographic detail on hiring trends (Reamer 2010).
- > Long-term occupational projections are prone to error and underestimate the demand for postsecondary education (Carnevale, Smith, & Strohl 2010). Moreover, they provide too little detail to accurately reveal local trends (Reamer (2010)).³

Meanwhile, industry advisory groups and regional sector strategies can be difficult and time-consuming to organize and maintain. With employers actively engaged, these groups can provide valuable insight about workforce needs, but they don't necessarily reflect broader trends within the local labor market; even the best advisory boards represent just a fraction of the total employers in a region or industry. Finally, apprenticeship programs can address employer needs for certain occupations, but they do not reach into certain industries or deep into particular local labor markets.

Above and beyond these constraints, community colleges typically lack the resources to conduct the deep, rigorous analyses needed to match curricula with the skill needs of local employers. What is sorely missing is a dependable source of information that can efficiently and effectively diagnose not only real-time demand for occupations and skill requirements but also emerging trends throughout a local labor market.

“REAL TIME” INSIGHT ON JOBS AND SKILLS

Discovering which local employers are hiring and what qualifications are needed for available jobs would be a significant step toward enabling community colleges to align program offerings with labor market demands. But until recently, it was impossible to gather information about these job vacancies in a timely, systematic manner. The Internet now provides an additional means for capturing hiring activity. Increasingly, employers are advertising job openings on their own websites or through online classifieds sites, government-run job banks, or fee-for-service job boards. Since 2006, employers have invested more in online outreach than in newspaper ads to recruit workers (Borrell Associates 2009). Recent research suggests that jobs advertised online now reflect at least 70 percent of all openings.⁴

Recognizing the treasure trove of data being produced, enterprising 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 (Goldberger 2010). College counselors can use the information to guide students toward program and course offerings tied to occupations with strong employment and earning potential.

Three Steps for Analyzing Online Job Ads

Several steps are involved in gathering actionable, real-time data from online job advertisements:

Step 1: Collect job advertisements posted on a wide range of online boards.

Step 2: De-duplicate those ads to ensure an accurate picture of available job openings by occupation and industry.

Step 3: Extract key information from job descriptions and analyze it to gain insight on job requirements and trends.

The quality and range of services available to analyze the real-time market are undergoing constant change, as new entrants, tools, and systems are introduced. Table 1 lists firms in this nascent field and the services they provide. As of June 2011, Career Builder had just released a new tool, the Supply and Demand Portal, while Simply Hired was enhancing its services.

TABLE 1.
CAPABILITIES AND ANALYTIC PROWESS OF JOB AD TECHNOLOGIES (AS OF JUNE 2011)

	COLLECTION	DE-DUPLICATION	EXTRACTION AND ANALYSIS	JOB MATCHING	NOTES
Indeed http://blog.indeed.com	√				<ul style="list-style-type: none"> > Free job board (aggregated) > Job/skill trends by keyword > Job-posting change (#) over time (month, quarter, year), for the nation, and by major industry > 50 metro area analyses of job trends and job-to-jobless ratios (number of unemployed-to-job openings)
Simply Hired⁵	√				<ul style="list-style-type: none"> > Free job board (aggregated) > Job-posting change (%) over time (month, year), for nation, by major industry, and by major occupation categories > 50 metro area analyses of hiring change, top hiring companies, job-to-jobless ratios
Geographic Solutions www.geographic-solutions.com/solutions-alm.asp	√	√			<ul style="list-style-type: none"> > Fee-for-service job board (aggregated and de-duplicated) > Job-to-jobless ratios > Customizable reports on industry/occupation distribution, education/work experience requirements, location of job openings, and employers

TABLE 1 CONTINUED

	COLLECTION	DE-DUPLICATION	EXTRACTION AND ANALYSIS	JOB MATCHING	NOTES
Monster http://about-monster.com/employment-index	✓ Also through partnership with Wanted Technologies	Through partnership with Wanted Technologies	Through partnership with Wanted Technologies;	✓ Also through new partnership with Trovix	<ul style="list-style-type: none"> > Free job board (Monster jobs only) > Job-posting change over time (monthly counts, year-over-year percent change) for the nation, regions, 28 metro areas, and by major industries and occupations > Supply-demand analysis (comparing the volume of job openings to resumes submitted to Monster) for major industries, as well as education and experience levels > Job-matching services: automated resume review and referrals
Wanted Technologies⁶	✓	✓	✓		<ul style="list-style-type: none"> > Fee-for-service job board (aggregated and de-duplicated) > Job-to-jobless ratios by occupation in major metro areas > Customizable data on occupations, industries, skill demands, and key search terms
Conference Board			✓		<ul style="list-style-type: none"> > Through a partnership with Wanted Technologies, the Conference Board conducts economic modeling analyses on job ad data to produce hiring trends over time through Help Wanted Online⁷ > Seasonally adjusted changes (#) in job postings over month, for the nation, regions, states, and major metro areas, as well as major occupation groups
Burning Glass—EmployOn www.burning-glass.com	✓	✓	✓	✓	<ul style="list-style-type: none"> > Fee-for-service job board (aggregated and de-duplicated) > Customizable data on skills, education/certifications, work experience, and information on salary and job openings/type; available by geography, time period, industry, occupation, or level of educational attainment, among other indicators > Job-matching services: automated review of resumes (for employers), resume building (for jobseekers), and career-exploration and skill-gap analyses

Step 1: Collecting Job Ads

Just as Kayak.com collects flights and fares from multiple airlines and other online travel services and merges them on a single, searchable website, enterprising firms have developed ways to pull job ads from thousands of websites, including job boards, company career sites, newspapers, nonprofits, and government agencies. Through a technique called spidering, firms can automatically collect job postings on a regular basis—sometimes even daily for active job boards or weekly for other sites. Not all spidering technologies are created equal: some firms are better able to locate and collect job openings on websites than others.

Some firms (e.g., Indeed, SimplyHired) make aggregated job postings available on public, searchable websites; other firms (e.g., Geographic Solutions) provide aggregated job listings through job banks that they administer for state governments. In either case, users can browse millions of current job ads and filter those searches by such criteria as location, job title and type, company name, salary, or education and work requirements.

Step 2: De-duplicating Job Ads

Employers and recruiting agencies tend to advertise job openings on multiple websites and in multiple formats. In addition, some companies specialize in collecting and reposting job ads from other websites. Thus, the same job opening can show up on hundreds of places online; if each location were counted independently, it would create a vastly inflated picture of job demand. To create a more accurate picture of available jobs, firms like Wanted Technologies and Burning Glass have developed ways to eliminate duplicates.

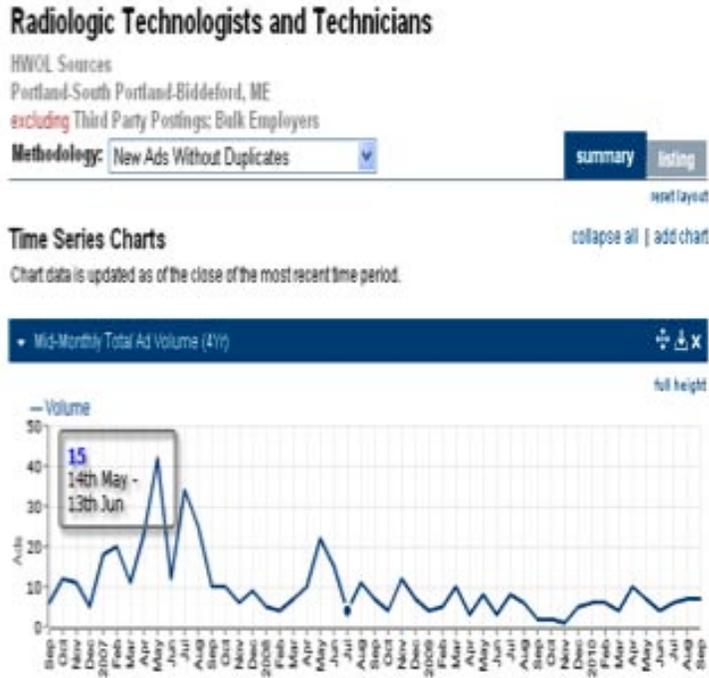
Some job aggregators can only eliminate duplicate job postings that are word-for-word identical. More advanced technologies can track down and delete duplicates that are formatted and written differently. They convert key elements within job ads to data and then compare the ads against a database of job-listing information. Data elements that are commonly coded include job title, location, employer, date of advertisement, and job description.

Step 3: Gathering Intelligence from Job Ads

The final step is extracting and analyzing labor market information from job ads. The sophistication of data extraction and analysis varies greatly. Some firms use simple keyword searches as a blunt tool for categorizing job ads by job title, location, and employer, as well as preferred educational degree, skill, or some other special interest, such as “green” or “social media.” At this level of sophistication, firms typically present general recruitment trends based on raw numbers of job postings.

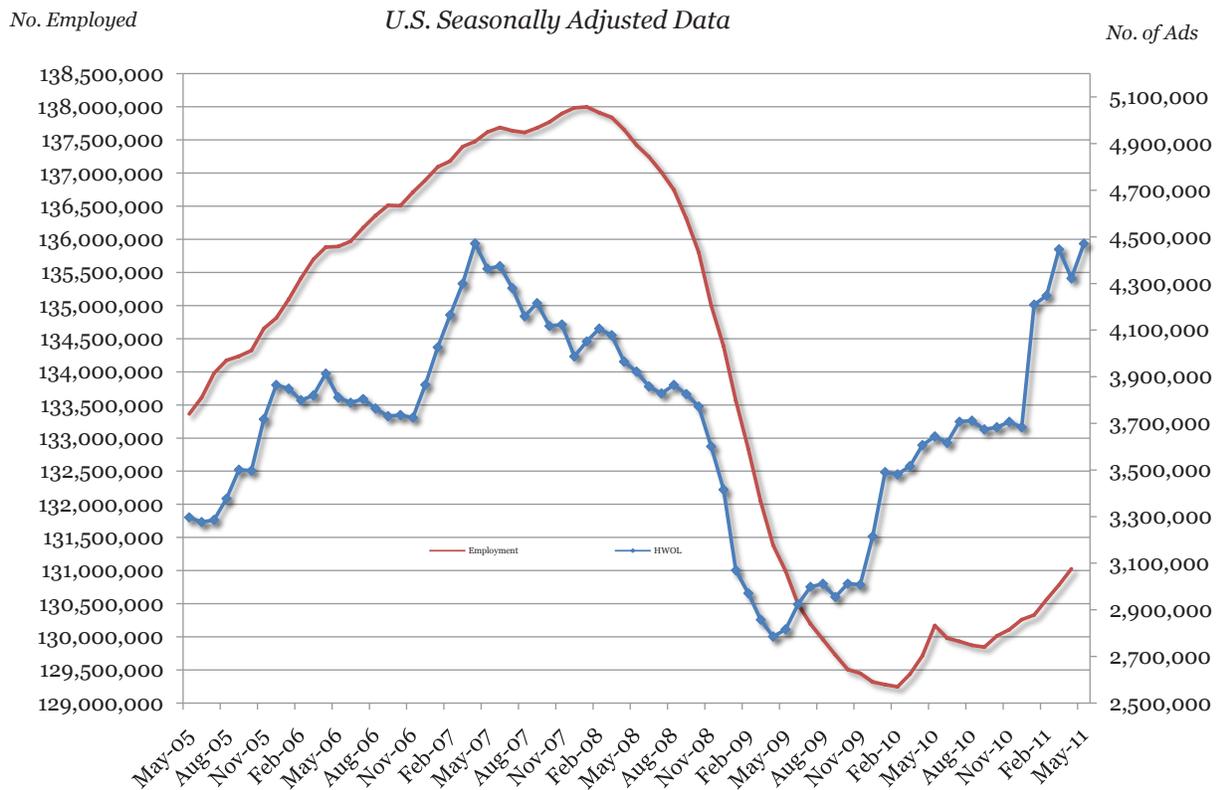
Other firms build off their de-duplication processes to more accurately search and extract key data elements. They categorize jobs by a specified occupation code (Standard Occupational Classification—SOC) and industry code (North American Industry Classification System—NAICS). This makes job ads a tool for providing real-time demand for a particular occupation in a specified area (see *Figure 1 on page 8*).

FIGURE 1.
HIRING ACTIVITY BY SPECIFIC OCCUPATION AND AREA, MAINE



Source: Maine Department of Labor; analysis conducted by Wanted Technologies

FIGURE 2.
HELP WANTED ONLINE INDEX OF EMPLOYMENT AND LABOR DEMAND, MAY 2005–MAY 2011

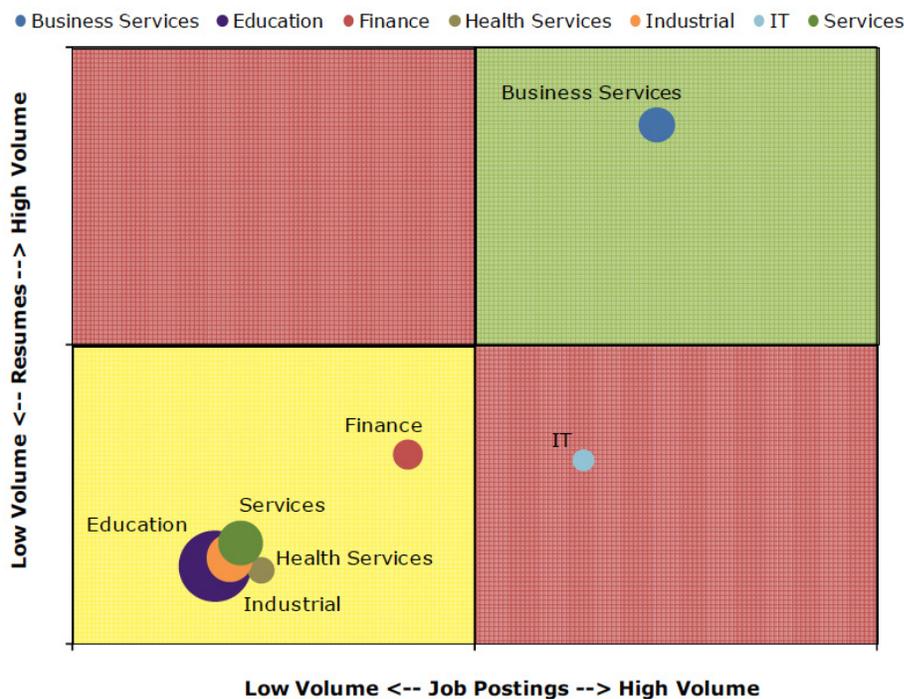


Source: The Conference Board, U.S. Bureau of Labor Statistics

Firms also run job data against economic models in order to seasonally adjust hiring figures. For instance, The Conference Board, in partnership with Wanted Technologies, issues a monthly report, Help Wanted Online, that provides a longitudinal time series of hiring activity dating back to May 2005 (Figure 2 on page 8).

In addition, firms typically combine job data with government and proprietary information sources for more meaningful labor market analyses, such as the supply and demand for skilled labor. Monster has teamed up with Wanted Technologies to compare job ads against its massive resume bank to assess workforce shortages and surpluses within local labor markets (Figure 3). For example, a matrix developed for the WIRED Initiative in Connecticut and New York show a high volume of IT job openings, coupled with a low supply of job applicants with IT skills. This would suggest a market for training IT workers. On the other hand, there was a high demand in business services occupations but also a high supply of candidates.

FIGURE 3.
SUPPLY-DEMAND MATRIX FOR CONNECTICUT–NEW YORK WIRED INITIATIVE,
JANUARY-DECEMBER 2008



Source: Blue-Green Research Institute; analysis by Monster

On the cutting edge, firms like Burning Glass and Trovix use “artificial intelligence” technologies to capture and infer greater detail from job postings. AI technologies are based on mining, interpreting, and cataloging the meaning of text within job ads—a process that becomes “smarter” with every job ad reviewed. Through a process called text segmentation, AI tools can distinguish between sections of a job ad that likely contain qualifications information versus compensation. Thus, an employee benefit of child care is less likely to be wrongly construed as a desired skill or work requirement.

Compared with keyword searches, AI makes it possible to accurately extract and code many more facts from each job ad, including work experience, desired educational degrees, general and occupation-specific skills, required certifications and licenses, and salary and benefits. AI tools also can infer education requirements for jobs when none are listed: they match job ads with others that have listed similar skill requirements or education preferences.

Firms using artificial intelligence also are better able to de-duplicate, code, and categorize job ads written in free-text format, like those posted on Craigslist. AI tools standardize terms within job ads, like job title and employer, making it easier to identify pesky duplicates. The technologies also are better able to recognize when multiple job openings are advertised within one advertisement.

Using Job Ad Data to Support Skill Matching

In addition, firms are leveraging data extraction and analysis techniques to help match qualified jobseekers with employers. Burning Glass and Monster (through its recent acquisition of Trovix) use AI tools to compare skills listed in job ads against those described in resumes uploaded to job boards. This makes it possible to identify jobseekers who fit an employment need. Through the automated process, employers and jobseekers get notice of a potential match. Burning Glass also has tools for helping jobseekers describe their skills and experience effectively in a resume and to identify skill gaps in their desired career paths.

EXAMPLES FROM THE FIELD

The use of online job ad analysis is growing. An increasing number of state governments, colleges, and other organizations have purchased licenses to analytic tools and reports in order to enhance their understanding of local labor markets and support programmatic decisions and investments. California, Delaware, Florida, Illinois, Michigan, Oregon, Pennsylvania, Texas, and Washington are among the states that have accessed Helped Wanted Online data (Holm, Bergman, & Prince 2010; Altstadt 2010). Ohio and Indiana are working with Wanted Technologies, while Minnesota and Arizona have brought in Burning Glass (Altstadt 2010). Florida, Pennsylvania, and the Mid-Atlantic Regional Collaborative—a consortium of Maryland, Virginia, and Washington, DC—have purchased licenses to Geographic Solutions to support state job banks and real-time analyses. The collaborative is developing a publicly accessible portal for the region's “green” job openings, as well as related education/training programs, career services, and labor market analyses.⁸

In several states, local Workforce Investment Boards, economic development agencies, and education institutions have purchased customized labor market reports from Monster (Stephen 2010). In Indiana, Monster data have been used in green job studies and to identify top skills and certificates within the traditional energy sector—informing the development of energy-specific courses by community colleges. A local WIB in Connecticut has incorporated Monster data into successful grant applications for workforce development programs.⁹

Ohio has plans to use Trovix artificial intelligence technology to extract and analyze the qualifications of jobseekers posting resumes on its Monster-supported state job bank. Economic development officials will use the skills data to attract employers to the state. Ohio may eventually use the AI technology to analyze job ads.

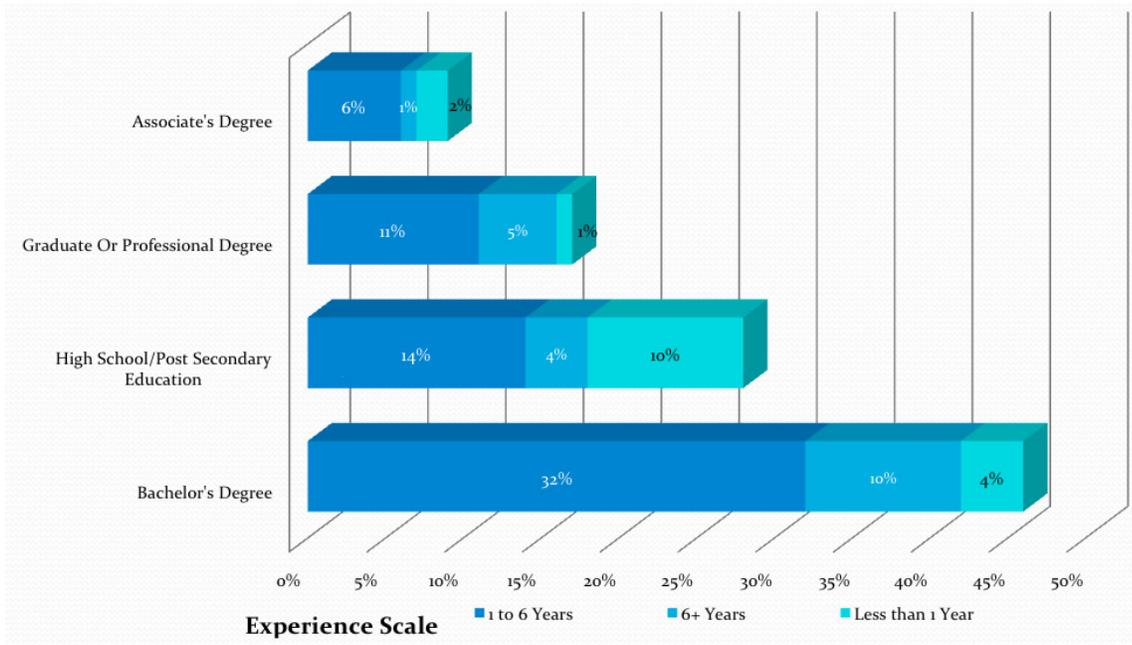
Five examples from the field stand out:

- > The Maine Department of Labor;
- > The Florida Agency for Workforce Innovation;
- > The Northeast Consortium;
- > The New Jersey Council of County Colleges Consortium for Workforce and Economic Development; and
- > Jobs for the Future's *Counseling to Careers* initiative.

The Maine Department of Labor was an early adopter of tools for collecting and using real-time labor market information. In 2008-09 the state partnered with the Conference Board, Wanted Technologies, and Burning Glass to improve labor market analyses in a variety of ways. Through the use of the technologies, Maine compares monthly changes in online job posts to the numbers of workers employed. In addition, the state can analyze preferred qualifications from job ads to determine the number of openings requiring a specified education

and experience, as well as certifications and skills in demand. According to analyses for the first half of 2010, a Bachelor's degree was the leading educational requirement (*Figure 4*). Finally, the technologies make it possible for Maine to categorize job openings by occupation, which, as a low-population state, it cannot do through federally sponsored statistical programs.

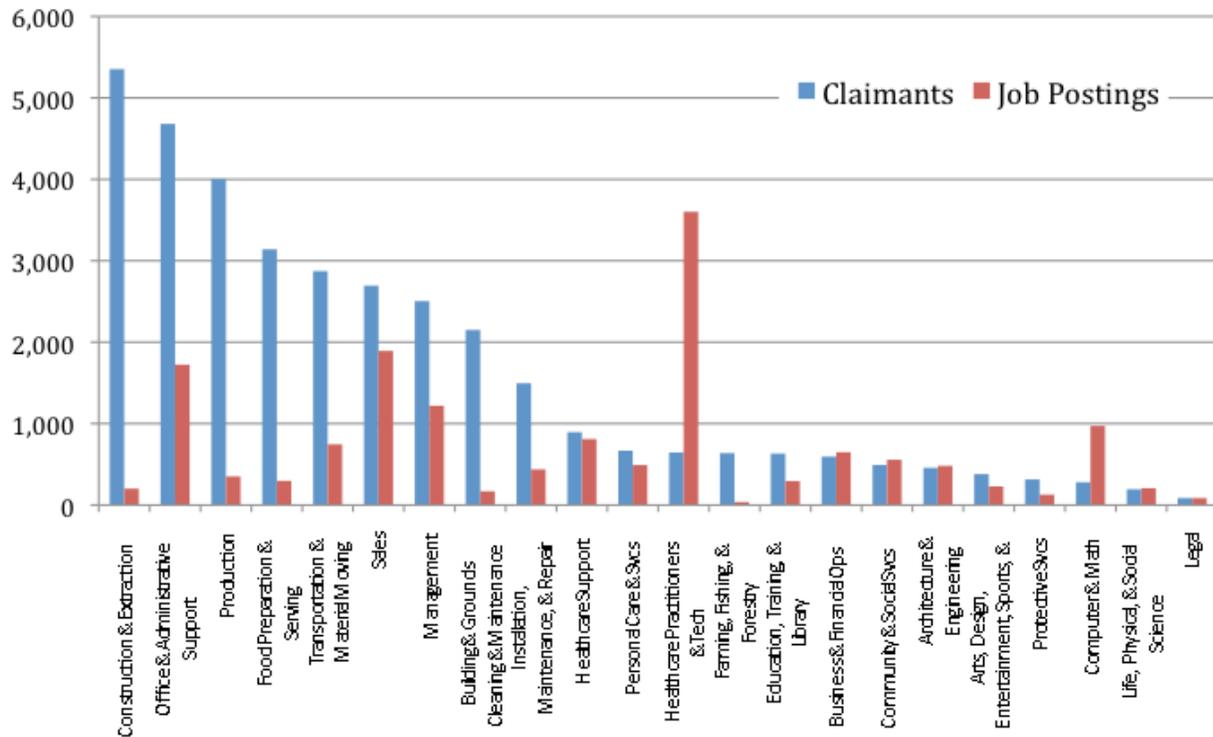
FIGURE 4.
EDUCATION AND EXPERIENCE REQUIREMENTS FOR JOB OPENINGS, MAINE, JANUARY-JUNE 2010



Source: Maine Department of Labor; analysis by Burning Glass

Through a simple comparison of job ads to records kept for unemployment insurance recipients, Maine can uncover major skill mismatches. Utilizing Burning Glass, the state found a major shortage of workers qualified to take substantial number of job openings in the health care sector, while there were significant surpluses of workers with experience in several other occupational clusters, notably office and administrative support, construction, and production (*Figure 5 on page 14*).

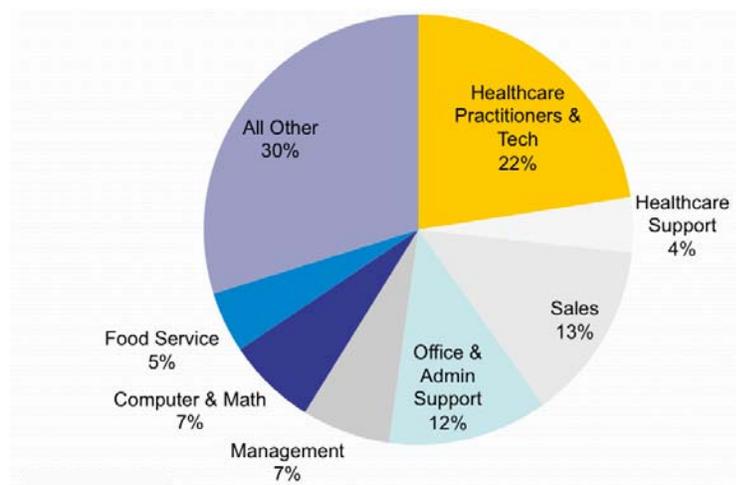
FIGURE 5.
COMPARISON OF UI CLAIMANTS AND JOB POSTINGS BY MAJOR OCCUPATIONAL GROUP, MAINE



Source: Maine Department of Labor; analysis by Burning Glass

Analysis by Wanted Technologies reinforced these findings, while providing occupation-specific employment figures. Health care accounted for nearly one-quarter of all job openings, surpassing all other occupational fields (Figure 6; see also Figure 1 on page 10).

FIGURE 6.
BREAKDOWN OF JOB OPENINGS, BY OCCUPATIONAL CLUSTER, MAINE



Source: Maine Department of Labor; analysis by Wanted Technologies

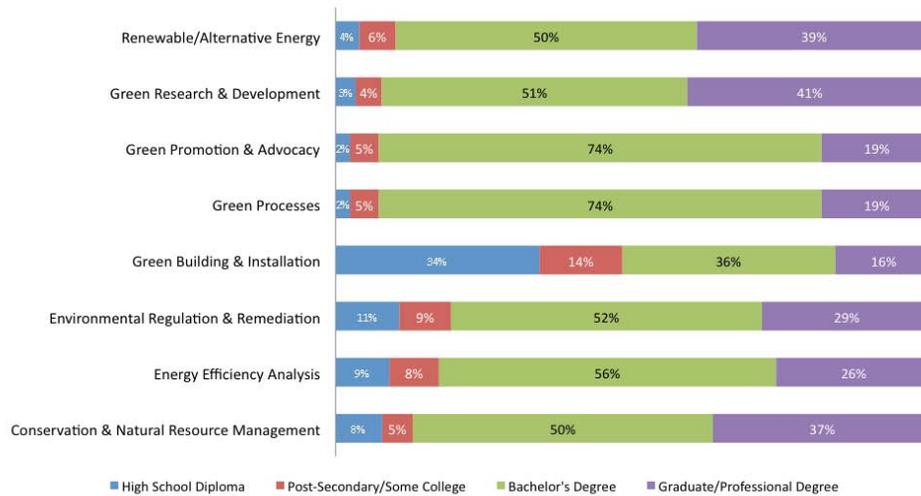
The Florida Agency for Workforce Innovation assesses labor shortages and surpluses, utilizing both providers of real-time labor market information and government-produced data. The state shares quarterly findings with local WIBs to support their reemployment and training efforts. To determine current and ongoing demand for workers in particular occupations, Florida compiles data from Help Wanted Online and Geographic Solutions, combining that with long-term occupational projections and other government statistical data. The demand-side data are compared against a range of sources representing workforce availability, including One-Stop Career Center enrollees, secondary and postsecondary students and graduates, and individuals registered on the state job bank. The state compares the skills, experience, and qualifications that can be gleaned from workforce records to the jobs data to determine whether occupations with job openings have an under- or overabundance of qualified jobseekers. Local WIBs use this intelligence to adjust their lists of education and training programs that qualify for subsidies. In addition, the state and local areas report hiring trends to the media and in monthly press releases.¹⁰

As part of the State Labor Market Information Improvement Grant Program, the U.S. Department of Labor awarded just under \$4 million to a consortium of Northeastern states and other partners to identify real-time demand for emerging green jobs and skills. **The Northeast Consortium** includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont, as well as the Conference Board, the Georgetown University Center on Education and the Workforce, the Direct Employer Association, the National Association of State Workforce Agencies, and the National Labor Exchange partnership. The consortium has developed a definition for green jobs and is working with Burning Glass to aggregate, de-duplicate, and analyze online job postings to determine the skill requirements, occupational demand, and “greenness” of available jobs (Georgetown University Center on Education and the Workforce 2010).

According to preliminary results tallied in 2010, green jobs have accounted for a surprisingly low 2 to 3 percent of all openings posted online in the Northeast. But despite the paltry job numbers, the consortium has identified significant trends in occupational and skill requirements: a Burning Glass analysis uncovered a larger inventory of green-related skills than identified through previous research by O*NET (Dierdorff 2009). This was accomplished by filtering job ads against O*NET-identified skills and analyzing those ads for additional skills related to green jobs. Burning Glass then refiltered all job ads against the larger skill inventory to find many more green jobs. In fact, two-thirds of all green jobs identified by Burning Glass would not have surfaced through the O*NET research. This included job openings for technical service managers, sales representatives, and interior designers that required green skills.¹¹

Burning Glass analysis has categorized green jobs by eight occupational clusters, identified prominent green-skill requirements and certifications, and determined the distribution of green jobs by educational level, their relative demand for work experience, and wages offered. For instance, the analysis found that nearly half of all green building and installation job openings require less than a four-year degree (*Figure 7 on page 16*).

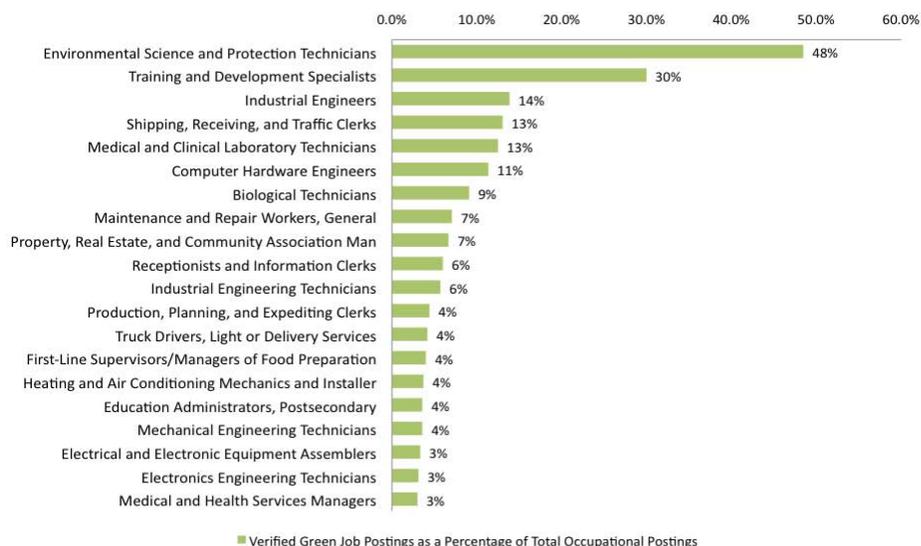
FIGURE 7.
EDUCATIONAL REQUIREMENTS BY OCCUPATIONAL CLUSTERS IN THE U.S. NORTHEAST,
JANUARY-JUNE 2010



Source: Burning Glass

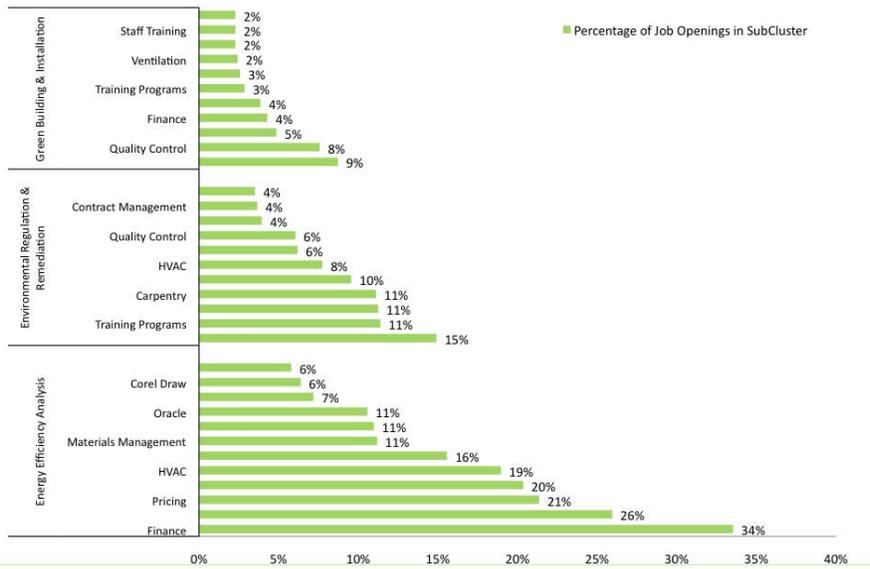
Additional analysis has identified key occupations and skills for workers with education below a Bachelor's degree (sub-BA, for short). According to the research, environmental science and protection technicians lead all other occupations in offering verifiable green jobs for sub-BA workers (*Figure 8*). Financial skills were cited as the most common skill requirement in advertisements for energy-efficiency jobs available to sub-BA workers (*Figure 9 on page 17*). Burning Glass differentiated jobs in occupational clusters by a hierarchy in desired qualifications: for instance, the analysis segregated an energy engineer from an entry-level energy auditor based on differences in skills, academic degrees, and qualifications required.¹²

FIGURE 8.
TOP GREENING OCCUPATIONS FOR HIGH SCHOOL AND SUB-BA JOBSEEKERS IN THE U.S.
NORTHEAST, JANUARY-JUNE 2010



Source: Burning Glass

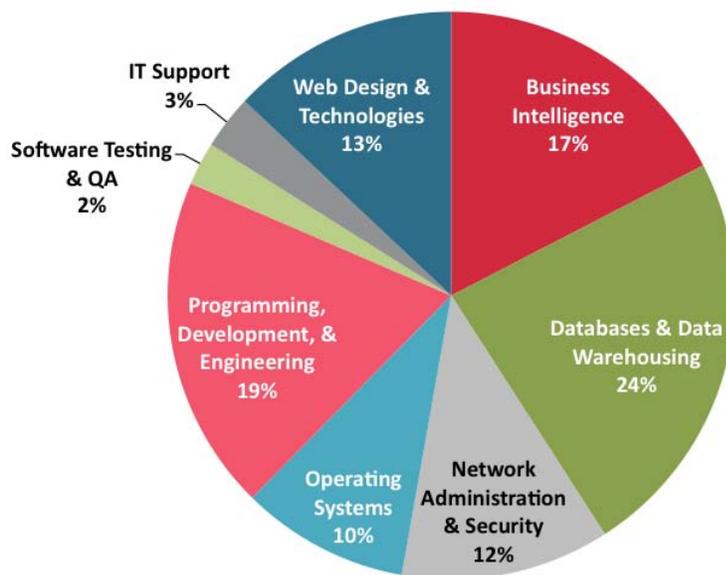
FIGURE 9.
TOP SPECIALIZED SKILLS FOR HIGH SCHOOL AND SUB-BA JOBSEEKERS IN THE U.S. NORTHEAST,
JANUARY-JUNE 2010



Source: Burning Glass

More recently, the Northeast Consortium has begun to examine labor demand in other industry sectors, including information technology. Similar to the green job research, Burning Glass has filtered job ads by established IT skills and scanned that subset of job ads for other skill sets. This process has proved successful at uncovering emerging skill requirements in IT, a sector known for constant change. The consortium has categorized IT skills into eight clusters. According to the analysis, database warehousing is the most common skill requirement (Figure 10).

FIGURE 10.
TOP IT SKILLS IDENTIFIED IN JOB ADS, JANUARY-MARCH 2011



Source: Burning Glass

Among other states receiving federal Labor Market Information Improvement Grants to assess labor market demand for green jobs and skills, [Arizona](#) also brought in Burning Glass to analyze online job ads. The state is comparing Burning Glass data to a recently completed job vacancy survey to assess the validity of both sources and to enhance knowledge about the clean energy economy.

Community colleges in New Jersey are using online job ads as a first step toward identifying opportunities to train jobless workers for difficult-to-fill jobs. This is made possible through a partnership between the [New Jersey Council of County Colleges Consortium for Workforce and Economic Development](#) and the New Jersey Department of Labor and Workforce Development, using job ad data from EmployOn, a subsidiary of Burning Glass.¹³

New Jersey's labor department produces reports on the top 25 occupations with job openings.¹⁴ The job trends are supplemented by government data to present a range of information on skill and education requirements, wages, current and projected employment, and unemployed workers with experience in those occupations. The findings are available at the state level every month and by Workforce Investment Board region every six months.

This real-time labor market intelligence piqued the interest of the state community college consortium. It now uses a monthly run of EmployOn data to identify training opportunities for occupations with significant hiring in a particular sub-state region, usually a three-county area. Once potential leads have been identified, the consortium's job developers contact the employers listing the jobs. The developers validate the job openings and determine whether the employers are having a hard time finding qualified workers. This process has eliminated from contention some seemingly hot jobs, like IT jobs, which are flooded with out-of-work applicants. If enough employers express a need for workers in a particular occupation, the consortium develops a customized training program geared toward preparing unemployment insurance (UI) recipients to fill open jobs.

The consortium heavily involves employers in verifying the skill requirements, designing the training curriculum, and screening potential trainees. The public workforce system is brought in to recruit UI recipients and determine their eligibility for Workforce Investment Act training funds, which pay for the training. One community college in the region is selected to deliver the program. So far, about 100 UI recipients have been trained for jobs as electronic technicians, bank tellers, and electromechanical engineering technicians—and in emerging health care occupations (e.g., patient service representatives). The placement rate is 82 percent.

Through [Counseling to Careers](#), Jobs for the Future has been working with community colleges in North Carolina to use traditional and real-time labor market data to guide students toward “best-bet” career pathways and associated community college programs.

With the assistance of JFF, community colleges are collaborating with public workforce systems, school districts, and other partners to comb through EmployOn and government statistical data and engage employers in search of best bet occupations that meet the following criteria: they have significant job openings in their particular region; require sub-BA credentials; pay wages at or above the local median; and are projected to grow. They also examine the capacity and success of community college programs to prepare students for these best bet occupations. Their efforts are expected to result in the development of fact sheets that counselors can use with students to help them make more informed decisions.

LIMITATIONS ON ANALYZING ONLINE JOB ADS

Despite the increasing use of and interest in analyzing online job ads for real-time labor market intelligence, the practice suffers from significant limitations in the data and weaknesses in the analytical technologies. As the building blocks for analyzing real-time labor market demand, online job ads have three substantial shortcomings:

- > Not all job openings are posted online, distorting the employment picture.
- > Deriving an accurate count of job openings posted online, comparable over time, is not yet possible because current technology cannot eliminate all duplicates and find all ads.
- > Few online job ads include complete information about desired qualifications.

Holes in Hiring Activity

On its face, online hiring activity might appear to be more than sufficient to provide meaningful analyses of the labor market. However, job ads do not provide an accurate employment picture across all industries and occupations. Research suggests that job openings in retail, food service, building maintenance, and construction are substantially undercounted online: those employers find workers by other means. Job activity in other sectors, such as information technology, health care, and management overall, are captured more completely online.¹⁵ According to researchers, the proportion of job openings advertised on the Internet would rise from 70 to 95 percent when excluding underrepresented construction and service-sector occupations.¹⁶

Flaws in the Data and Analysis

The job openings that are advertised online are done so in many places, but the ability of various technologies to catch and eliminate duplicate ads on aggregated sites differs greatly. Estimates vary on the number of duplicates that exist in job data. Burning Glass reports that at least half of all job ads that it collects are duplicates and that it eliminates them.¹⁷ Technologies that compare the full text of job ads miss at least one-quarter of duplicates.¹⁸ In calling up employers and culling through job ads, job developers in New Jersey uncovered significant numbers of duplicates—as much as 40 percent of the listings for some occupations.¹⁹ Meanwhile, duplication appears to be less of a problem for the Northeast Consortium project. State labor market information agencies participating in the project double-checked a small sample of job ads that had already gone through Burning Glass's de-duplication process and found that only 3 percent of ads were duplicates (Jayasundera 2011).

As a result of flaws and discrepancies in “spidering” and de-duplicating technologies, firms are reporting wildly different job counts across the country, raising concerns about the validity of the data and the process. Recognizing these deficiencies, real-time providers are improving their processes for collecting and cleaning their data. In January 2011, the Conference Board reduced its monthly job totals by about 11 percent after improving de-duplicating methodology, eliminating invalid job ads, and adjusting coverage of job boards. Monster has decided to hire an independent auditor to review its data and release the results to the public. Researchers for the Northeast Consortium uncovered a glitch with Burning Glass’s data scrapers, which had caused a sudden drop in job listings in late 2009 to early 2010. The problem has since been fixed. Meanwhile, Burning Glass has improved its spidering technology through the acquisition of EmployOn, which has tripled the number of websites scanned for job openings.²⁰ As a result, researchers for the Northeast Consortium have reported a significant increase in job openings through the Burning Glass data.

It remains unclear what portion of increasing job ad levels should be attributed to actual hiring activity versus improvements in spidering technology. Growth of job ad levels may just reflect that more employers are turning to the Internet to post their job openings. In particular, free sites like Craigslist have attracted many jobseekers, and technologies like Burning Glass are becoming more adept at capturing those types of ads.²¹

These continued changes in technologies and methodologies call into question both the reliability of reports on hiring trends and predictions of future employment needs. The continuous improvements to job ad analyses hinder reliable comparisons of labor market demand over time. This sort of time-series analysis is common among federal statistical programs because of continuity in their data collection methods; in the case of its monthly reports on employment, the government uses economic models to adjust jobless rates based on seasonal differences in hiring activity. Firms such as the Conference Board also use economic models to adjust job ad levels reported through Help Wanted Online in an effort to improve the reliability of comparing listings over time.

Still, researchers suggest that analyses of online job ads may simply provide a signal for employment trends three to six months beyond their release. The short-term nature of reliable projections is enough for education institutions to develop and deliver short-term training programs to fill immediate workforce needs. However, institutions may not have enough time to realign and ramp up degree programs, unless employers indicated an ongoing skill need.²² Furthermore, most job ads are not detailed enough and analytic technologies are not yet smart enough to return reliable intelligence on hiring needs within a particular industry subsector or zip code. Researchers advise keeping job ad analyses to two-digit NAICS codes and at geographic areas no smaller than metropolitan areas.²³

Missing Information on Skills

It is a relatively straightforward process to gather information in job ads that have fields for job title, location, employer, education requirements, and other information. But it has proven challenging to extract detailed information from job ads. Those written in free text format, like those published on Craigslist, are difficult to analyze. Moreover, many employers do not identify education requirements or other qualifications. Research conducted for the Northeast Consortium found that less than 40 percent of ads contained information on desired academic credentials. Some omissions are easily explained: employers seeking a physician or lawyer may not see the need to identify a M.D. or J.D. as a prerequisite for employment.

As mentioned previously, artificial intelligence technologies are increasingly able to infer education requirements in job postings that require similar skills; this cutting-edge analysis can capture perhaps another 10 percent of job postings.²⁴ However, these technologies are not sophisticated enough to infer academic degree, education, or certification requirements in the absence of a similar job ad for comparison. For most job openings, the lack of preferred academic credentials means data users, including community colleges, cannot make meaningful assessments about the qualifications needed to perform particular occupations.

Additionally, artificial intelligence has limitations on uncovering emerging skills; AI tools only can extract skills that are added to search lists. If real-time analysts are unaware of new skill sets—and these are constantly emerging in information technology and some other sectors of the economy—then AI tools will not extract them from job ads.

Even when education and skill requirements can be captured or inferred, there is still the question of whether online hiring activity represents true labor supply and demand. Research suggests that skill requirements in job ads may not accurately represent employer demand; rather, the ads are more likely to require higher skills than other available jobs within the same field that are not posted online.²⁵ This is also because job postings generally tend to seek out the best possible—even overqualified—candidates. In particular, this puts into doubt whether most green jobs require the high levels of skills reported by Arizona and the Northeast Consortium. Additionally, just as job ads skew toward higher-skill positions, jobseekers who post resumes online tend to be more qualified (and older) than the U.S. labor force as a whole.²⁶ Analyses of workforce shortages and surplus need to take this into account.

PROMISE AND POTENTIAL

Emerging technologies that collect and analyze job openings advertised on the Internet have the potential to provide community colleges with rich arrays of real-time intelligence about the occupational and skill demands in their local labor markets. These tools have helped quantify demand for green jobs and emerging skill requirements while uncovering labor market mismatches, customized training opportunities, and best-bet occupations. Yet gaps in available data and constraints in the technology have hamstrung the promise of real-time labor market information. Of principal concern, not all job openings are posted online, duplicate ads are rampant and difficult to eliminate, and few online job ads include complete information about desired qualifications.

Any and all approaches for assessing labor market demand have their limitations. Data collected from online job ads are best used to complement—not replace—other ways that community colleges can identify labor market needs. Pairing online job ads with government-backed statistics and projections and business outreach efforts can dampen shortcomings inherent with each approach and provide the best insights on immediate and ongoing occupational and skill demands. While online job ads are better for uncovering immediate job openings and emerging skill requirements, government statistics offer a broader assessment of economic conditions, such as employment levels, earnings, and the number of establishments within industry sectors. Moreover, cross-referencing skill information from online job ads with O*NET data produces better intelligence about the qualifications needed to perform specific occupations. Additionally, utilizing both real-time and traditional labor market information opens up new forms of analysis. Matching job-ad data to Unemployment Insurance records can reveal workforce shortages or surpluses for in-demand occupations.

Although collecting data from online job ads can be an efficient way to gather intelligence on local workforce needs, it does not replace direct communication with employers. Only by collaborating with employers can community colleges know for certain which occupations and skills are in demand and whether or not there are enough qualified workers to fill available jobs. On the other hand, online job data can validate and enhance labor market analyses conducted by industry advisory groups and sector partnership initiatives—ensuring that their findings represent the needs of local employers who are not sitting around the table. Job ads also can provide leads on employers who may be interested in customized training and apprenticeship solutions.

By taking such a comprehensive approach to analyzing their local labor markets, community colleges can tailor programs and course content to their markets and ensure that students are prepared to build marketable skills for growing careers.

ENDNOTES

¹ Lumina Foundation's "big goal" is "to increase the proportion of Americans with high-quality degrees and credentials to 60 percent by 2025." See: http://www.luminafoundation.org/goal_2025.html.

² See: "Making College More Affordable," issue statement of President Barack Obama. Available at: <http://www.whitehouse.gov/issues/education/higher-education>. Accessed May 16, 2011.

³ See also author interviews with John Dorrer, then of the Maine Department of Labor, July 1, 2010, and September 27, 2010.

⁴ Author interviews with Jim Vollman, Advanced Workforce Systems, September 13 and 27, 2010, and March 15, 2011; and John Dorrer, Jobs for the Future, June 17, 2011.

⁵ For more information, see: "Simply Hired Releases February Job Trends Report," March 2, 2011. Available at <http://blog.simplyhired.com/2011/03/simply-hired-releases-february-job-trends-report.html#axzz1FYyBGe3k>. Accessed May 26, 2011.

⁶ For more information, see: "Welcome to NEW WANTED Analytics." Available at: <http://www.wantedanalytics.com/wa/home?exclude=anonymous%2Cbulk%2Cduplicates%2Cexpired&passkey=free13&require=&jloc=county-258&jfunc=17>. Accessed May 26, 2011.

⁷ For more information, see: "The Conference Board Help Wanted OnLine," May 2, 2011. Available at: <http://www.conference-board.org/data/helpwantedonline.cfm>. Accessed May 26, 2011.

⁸ For more information, see: "The MARC Green Consortium." Available at: <http://www.marcgreenworks.com/gsipub/index.asp?docid=394>. Accessed May 26, 2011.

⁹ Author interview with Michael McCarthy, Blue-Green Research Institute, The WorkPlace, February 28, 2011.

¹⁰ See: "Florida's January Employment Figures Released." State of Florida Agency for Workforce Innovation press release, March 3, 2011. Available at: http://www.floridajobs.org/publications/news_rel/LMS%20Release%2003-10-11.pdf. Accessed May 26, 2011.

¹¹ Author interviews with Susan Goldberger, Burning Glass, February 10, 2011; and Yustina Saleh, Burning Glass, February 21 and March 15, 2011.

¹² Goldberger and Saleh interviews.

¹³ Author interviews with Robert Bowman, New Jersey Council on County Colleges, February 24, 2011, and Saleh interviews.

¹⁴ For more information, see: "Real Time Jobs in Demand 2011 (March data)." State of New Jersey, Department of Labor and Workforce Development. Available at: <http://lwd.dol.state.nj.us/labor/lpa/content/RealTimeJobsinDemand.html>. Accessed May 26, 2011.

¹⁵ Author interview with Tamara Jayasundera, Georgetown University Center on Education and the Workforce, February 17, 2011.

¹⁶ Vollman interview.

¹⁷ For more information, see: "Job Spidering." Available at: <http://www.burning-glass.com/technology/job.html>. Accessed May 26, 2011.

¹⁸ Saleh interviews.

¹⁹ Bowman interview.

²⁰ Author interview with Matthew Sigelman, Burning Glass, June 15, 2011.

²¹ Sigelman interview.

²² Strohl interviews; Vollman interview.

²³ Strohl interviews; Vollman interview.

²⁴ Saleh interview.

²⁵ Author interview with Ken Poole, Council on Community and Economic Research, March 15, 2011.

²⁶ Author interview with Bruce Stephen, Monster; and Mark Birnbrich, Ohio Department of Job and Family Services, March 15, 2011.

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