

CAREERLINK SKILLS: ANALYZING IT SKILLS FROM ONLINE JOB POSTINGS

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INTRODUCTION

The technological job skill needs of business and industry are continually evolving, which presents a challenge to educators and students attempting to focus on the right skills to meet these changing needs. If colleges want to attract more students and place them in jobs, there must be better alignment between program offerings and local labor market needs. One strategy to monitor current skill requirements in the workforce is to analyze employers' job postings. Educators can use this data in the form of an evolving list of skills to focus training and curricula. This research study examines a year of job posting data in the Midwest region to compile a list of the top information technology (IT) job skills that are in demand. The research will also investigate how factors such as company size and industry affect desired IT job skills. Finally, this report will identify IT job skill clusters.

BACKGROUND

Economic and social forces have dramatically changed the labor market. Education is expected to adapt to meet the changing needs of our society. As emerging technologies change the IT job market, job positions and the skills associated with them are evolving rapidly. IT job opportunities continue to be plentiful, but job applicants are expected to have mastery of up-to-date, relevant technological skills.

Educators and administrators at community colleges commonly review government statistics, which include labor market trends and occupational projections, and convene industry advisory boards to adapt curricula continually for their technical programs. While these methods offer valuable insight, they also have some limitations. Government statistics are generally not specific down to the local level and may not offer detailed analysis by industry, occupation, or location. In addition, the data in government statistics is usually out of date by the time it is publicly available. Industry advisory boards, on the other hand, do not always offer a comprehensive view of the total employers in a region or industry and they may not reflect broader trends at the state or national levels. One tool that can bridge the gaps and complement these existing strategies is the use of real-time labor market data from job postings.

This research is conducted by The Midwest Center for IT (MCIT), a NSF-funded consortium of AIM and 10 community colleges in Nebraska, Iowa, North Dakota, and South Dakota. AIM, the lead organization for MCIT, is a not-for-profit community organization that promotes technology to empower people, enhance organizations, and create brilliant communities. AIM conducts research on workforce and IT pipeline trends. AIM also serves over 2,000 youth annually with technology and college preparation programs. AIM annually hosts Infotec, a national IT conference, as well as a series of IT trainings for educators. As part of AIM's mission, Careerlink.com, a job posting website, was established in 1995.

In MCIT's service region, Careerlink is the largest online job resource. At any given time, Careerlink includes approximately 7,500 jobs in the Midwest. A total of 2,650 employers in the region post career opportunities on the Careerlink site. Careerlink receives a great deal of web traffic, with over 225,000 user sessions per week. Approximately 85% of the jobs posted on Careerlink are within MCIT's service region of Nebraska, Iowa, North Dakota, and South Dakota.

Careerlink offers several benefits to MCIT. First, Careerlink enables stronger connections between students and industry. Second, the Careerlink site situates learning in the larger context of industry needs and regional employment. Third, the site allows for longitudinal tracking of students to determine how MCIT's programs affect career outcomes. Careerlink also allows employers to select skills associated with the job they are posting. This data can be collected and analyzed to determine which skills are currently in demand by employers, which can thereby help college educators and administrators in determining educational curricula in programs and classes.

METHODOLOGY

RESEARCH QUESTIONS

This research asks the following questions:

1. What were the top IT job skills in the past year?
2. How do IT job skills vary by industry? Specifically, how do IT job skills vary between IT versus manufacturing and distribution industries?
3. How do IT job skills vary by company size?
4. What IT job skills commonly cluster together?

DATA COLLECTION

Data was collected from the Careerlink job posting website. The period of data collection included the calendar year of 2013, thereby offering a year of job information. The data derived from Careerlink included unique job ID, actual job title, standardized job title, requested IT job skills, industry, company name, company size, and company location. The unique job ID ensured that jobs were not counted multiple times, even if the job posting had been renewed. Actual job title and standardized job title were both captured, primarily because the actual job titles can vary between companies. Employers often want their job titles to reflect the company culture. Thus, a web developer may have the title of "dreammaker." The standardized job title enables more accurate comparisons between job titles.

RESEARCH STRENGTHS AND LIMITATIONS

This research project and data collection methodology offers several key strengths. First, Careerlink data offers real-time, up-to-date information on job openings and IT skill trends. An additional strength involves the ability to analyze job skills by a variety of factors, including industry, company size, location, job title, educational and experience requirements, and salary.

Another advantage of this research is that it enables the development and tweaking of occupational and education programs to match current job market needs. Educators and college administrators can follow the recent trends in IT job skills and adapt their programs as needed. While this data can be a useful tool for the adjustment and improvement of educational programs, it is not intended to supplant traditional industry advisory boards, which provide valuable input.

An additional strength of this study's job data is that it is free of duplicates. Some previous studies (Altstadt, 2011; Ezarik, 2011) have examined job postings to determine job skills by relying on web scraping of multiple job boards. Web scraping, also known as web harvesting, is a technique of automatically extracting information from websites. The reliance on job data from third-party websites often resulted in a high number of duplicate entries. This occurred for two reasons. First, employers frequently repost their jobs. Simple web scraping techniques may not reveal that job postings of this nature are duplicative. A second reason for the high number of duplicates is that job boards frequently scrape each other. Therefore, web scrapings from multiple job board websites can result in numerous instances of a single job opportunity, calling into question the reliability of the findings of these previous studies (Altstadt, 2011). In one study of IT job skills, it was revealed that as many as two-thirds of the jobs in the data were duplicates (Gonzalez, 2012). The jobs data used in the present report is confirmed to be free of duplicates.

The job skill data derived from Careerlink has a couple of limitations. First, not all job openings are listed on Careerlink. Further, not all jobs are posted online. Therefore, this data does not draw from the total number of job opportunities available. The majority of online job ads in the area, however, are included in this research. A second limitation involves incomplete job data. Some of the job posts do not include data for all the possible fields. For example, some employers choose not to include salaries or other key data for all job postings.

The current skills and the skill selection interface for employers posting jobs presents additional limitations for this research. At present, employers are able to select skills from a single list. Efforts have been made to ensure the comprehensivity of the IT skills list by working with IT consultants and postsecondary educators. Employers have also been able to suggest new skills, which are then vetted and added to the list. Omissions, however, may remain. Additionally, some skill designations may be overly simplistic or unnecessarily inclusive. One such example is .NET as a single skill. The skill selection interface also has its limitations, namely that there is no way for employers to rank-order skills, identify skills as preferred or required, or indicate a level of proficiency desired. Without this level of detail in previously collected data, it is not possible to disentangle the importance of individual skills in ex-post facto analysis. Careerlink is currently improving its skills list and interface in order to provide richer data in the future.

DESCRIPTIVE STATISTICS

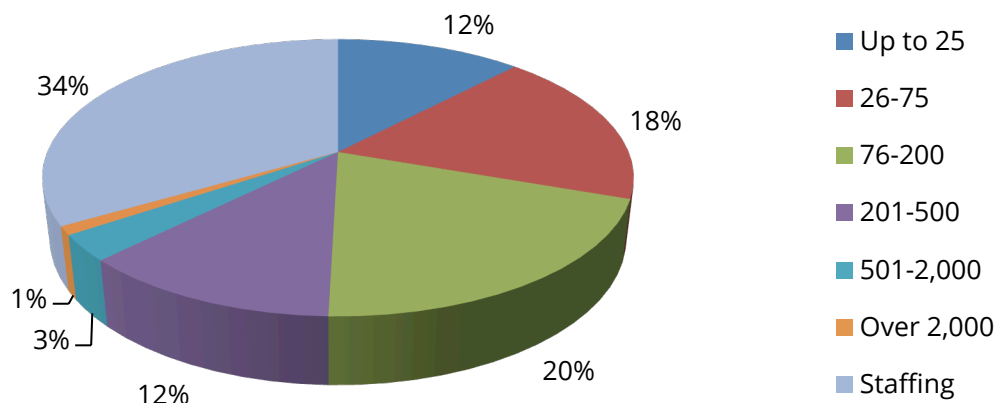
Over 200,000 jobs were posted on Careerlink between January 1 and December 31, 2013. The system includes 331 unique IT job skills. Employers identified IT skills associated with 15,954 jobs. A total of 122,467 IT skills were identified over the past year. The data includes 761 companies from 58 industries. Six of the most common industries include information technology; financial services; human services; healthcare, wellness, and fitness; manufacturing and distribution; and staffing agencies. These descriptive statistics are shown in Table 1.

Table 1: Descriptive Statistics

Jobs posted on Careerlink in the past year	233,069
IT skills	331
Jobs with defined IT skills	15,954
Total number of IT job skills designated	122,467
Companies	761
IT Occupations	309
Unique IT job titles	3,178
Industries	58

A total of 3,178 unique job titles were represented in the data. The most common job titles include software developer, database administrator, .NET administrator, and .NET developer, Java software engineer, and web developer. These 3,178 jobs can be organized into 390 IT occupational categories.

Figure 1: Size of Company by Number of Employees



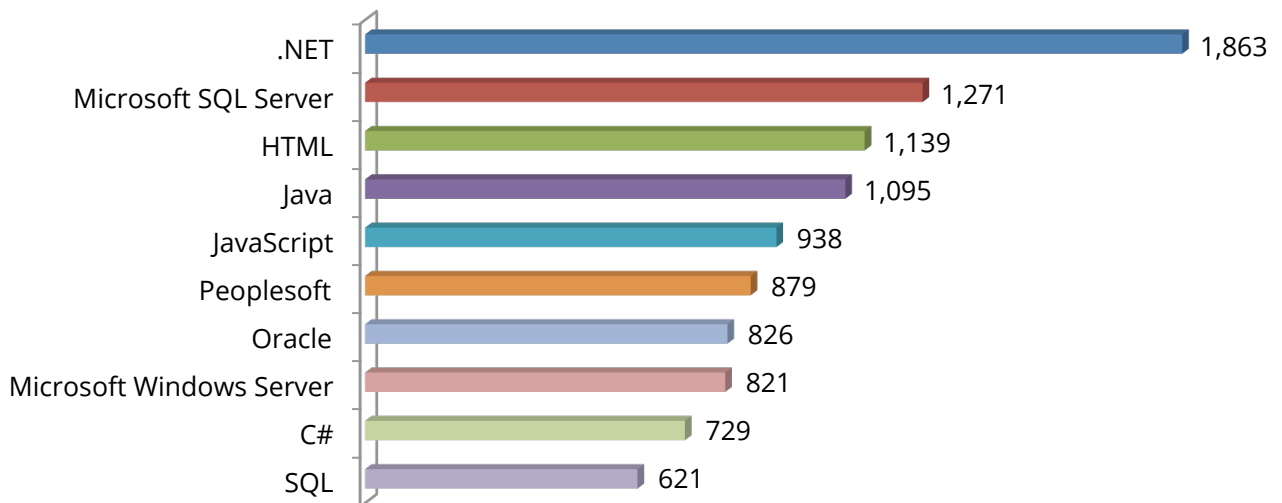
Approximately half of the companies represented in this data had 200 or fewer employees, as shown in Figure 1. An additional 15% had 201-2,000 employees. Only 1% of the companies in this research employed over 2,000. Approximately one-third of the companies in this data were staffing agencies.

RESULTS

TOP IT JOB SKILLS

The chart in Figure 2 highlights some of the top IT job skills represented in the job postings on Careerlink over the past year. The top IT job skill was .NET, which appeared in 1,863 unique job postings over one year. During data collection, the .NET skill designation included several .NET sub-skills, which boosted its ranking as the most requested IT job skill. In the future, Careerlink plans to add more detail to .NET skill designations. Other top IT job skills in the current analysis included Microsoft SQL Server, HTML, Java, JavaScript, Oracle, Microsoft Windows Server, C#, and SQL.

Figure 2: Top 10 IT Job Skills



GENERAL IT SKILLS

The results of this research are primarily focused on technical job skills. The data also showed high demand for software and operating system experience as well. For example, required experience with Microsoft products appeared in many job postings. Some of the most requested general IT skills included Microsoft software and operating systems such as Office, Windows Desktop, Access, and Project; Apple Mac OS X; and Adobe software including Acrobat, Creative Suite, Photoshop, and InDesign.

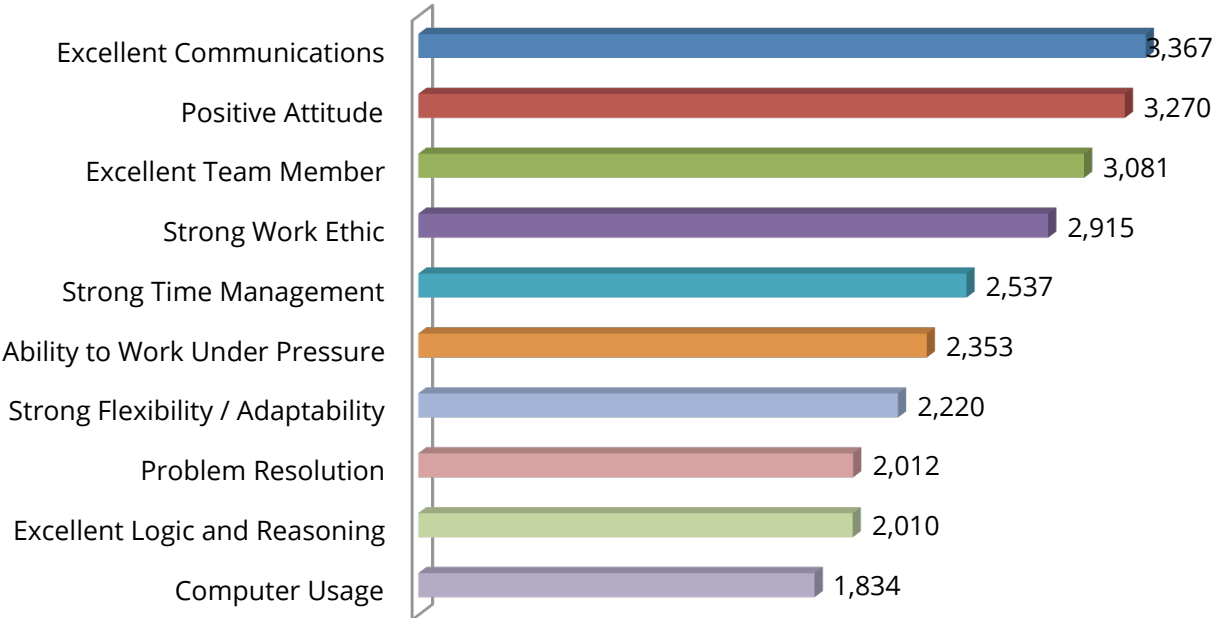
SOFT SKILLS

Many of the important skills for employability are outside the “hard skills” or technical skills that are easily measured, easily trained, and closely connected with an employee’s knowledge (Balcar, 2014; Balcar, Homolová, & Karásek, 2011). This additional set of skills, often called “soft skills,” can be described

as intangible skills that are hard to measure and closely connected to an individual's attitudes (Balcar, 2014). Common examples of soft skills include communication, cooperation, leadership, independence, and creativity. The importance of soft skills has increased significantly in recent decades, especially in jobs that require a combination of both cognitive and soft skills (Balcar, 2014).

The Careerlink data reveals that in addition to the IT skills, employers also indicated their demand for jobseekers with a number of soft skills. As Figure 3 shows, employers requested job candidates to have soft skills including excellent communication, positive attitude, excellent team member, strong work ethic, strong time management, ability to work under pressure, strong flexibility and adaptability, problem resolution, excellent logic and reasoning, and computer usage.

Figure 3: Soft Skills



VARIATION IN IT JOB SKILLS BY INDUSTRY

The IT job skills most requested by employers varied by industry type. To exemplify the skill differences by industry, this research examined the top IT skills in companies in the IT industry and those in the manufacturing and distribution industry. As expected, the IT job skills needed in these industries varied widely.

Figure 4: Top IT Job Skills Requested by IT Companies

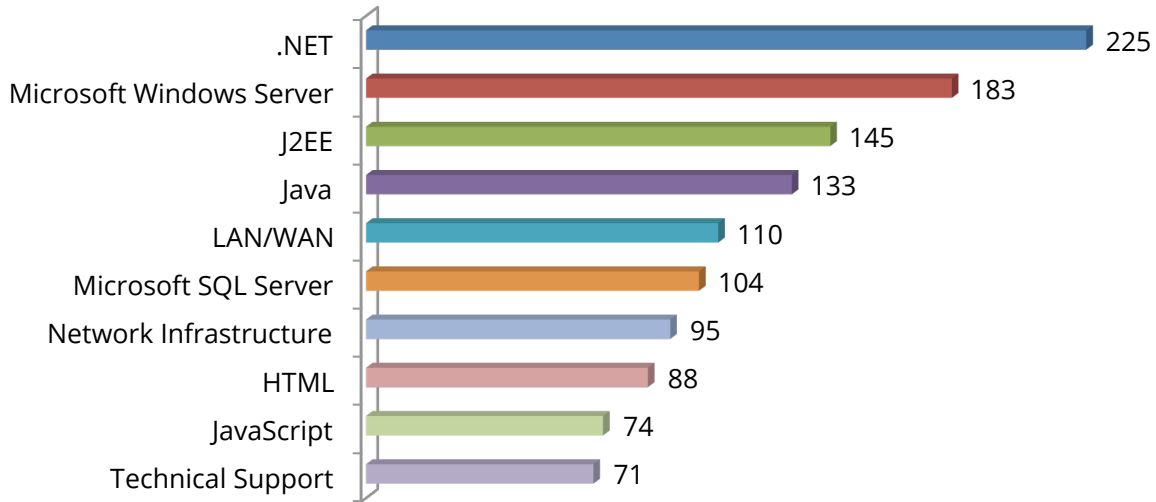
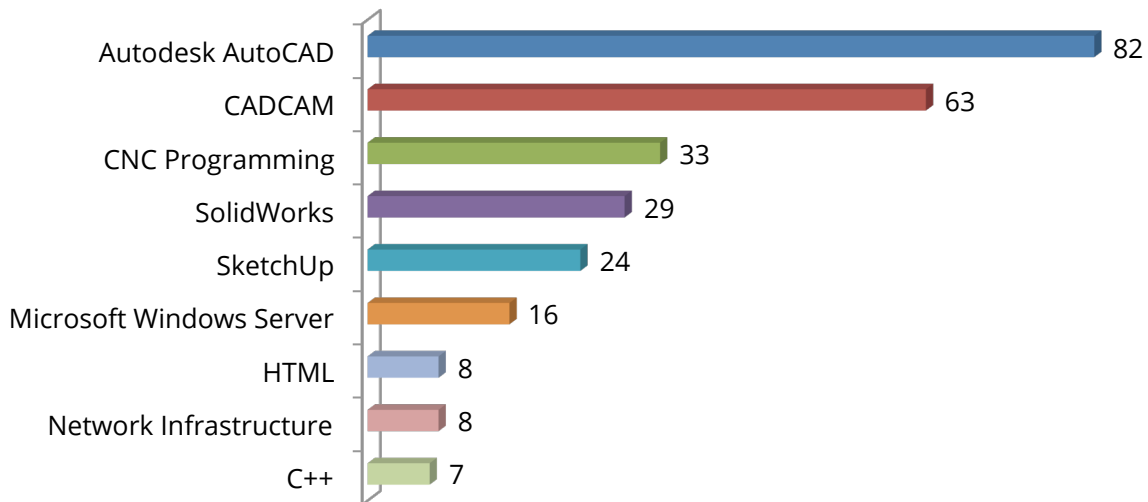


Figure 5: Top IT Job Skills Requested by Manufacturing and Distribution Companies



VARIATION IN IT JOB SKILLS BY COMPANY SIZE

Some variation in the most requested IT job skills was found when comparing companies of different sizes. This research examined companies with under 200 employees, companies with 200 – 2,000 employees, and companies with over 2,000 employees to assess variation in the top IT job skills. Although some variation was found, it was not as large as the differences between employers in different industries.

Figure 6: Top IT Job Skills Requested by Companies with Fewer than 200 Employees

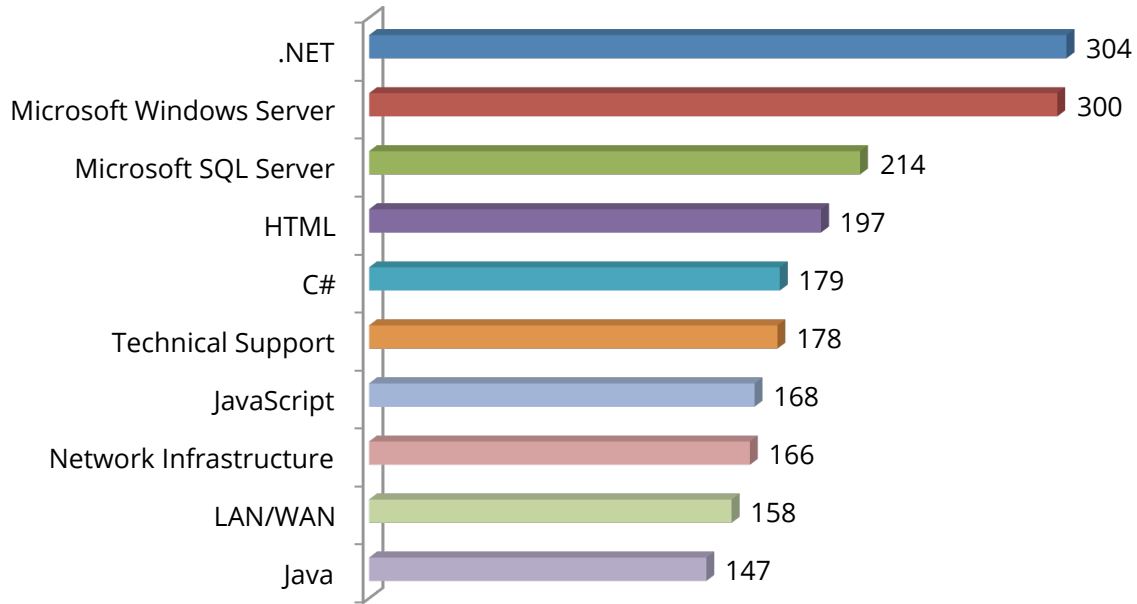


Figure 7: Top IT Job Skills Requested by Companies with 200 - 2,000 Employees

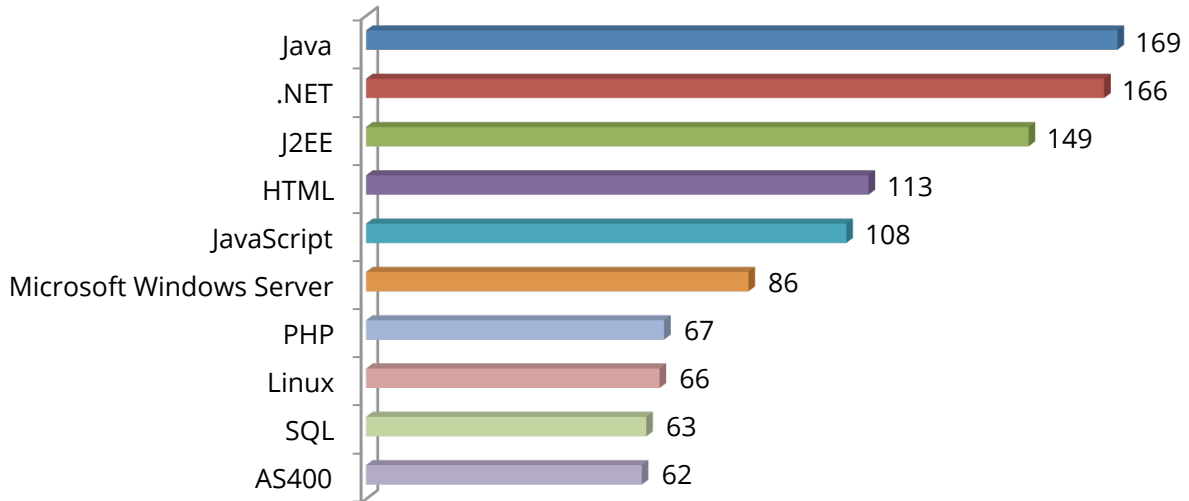


Figure 6 shows the top IT job skills in companies with fewer than 200 employees. The top IT skills in companies of this size included .NET, Microsoft Windows Server, Microsoft SQL Server, HTML, C#, Technical Support, JavaScript, Network Infrastructure, LAN/WAN, and Java. The top IT job skills in companies with 200 – 2,000 employees is shown in Figure 7. Java was the top requested IT job skills in the middle-sized tier of companies, followed by .NET, J2EE, HTML, JavaScript, Microsoft Windows Server, PHP, Linux, SQL, and AS400. The largest companies – those with over 2,000 employees – were most

likely to request IT job skills such as Microsoft SQL Server, IBM DB2, JavaScript, Java, Microsoft Windows Servers, .NET, HTML, Linux, AS400, and Technical Support, as shown in Figure 8.

Figure 8: Top IT Job Skills Requested by Companies with Greater than 2,000 Employees

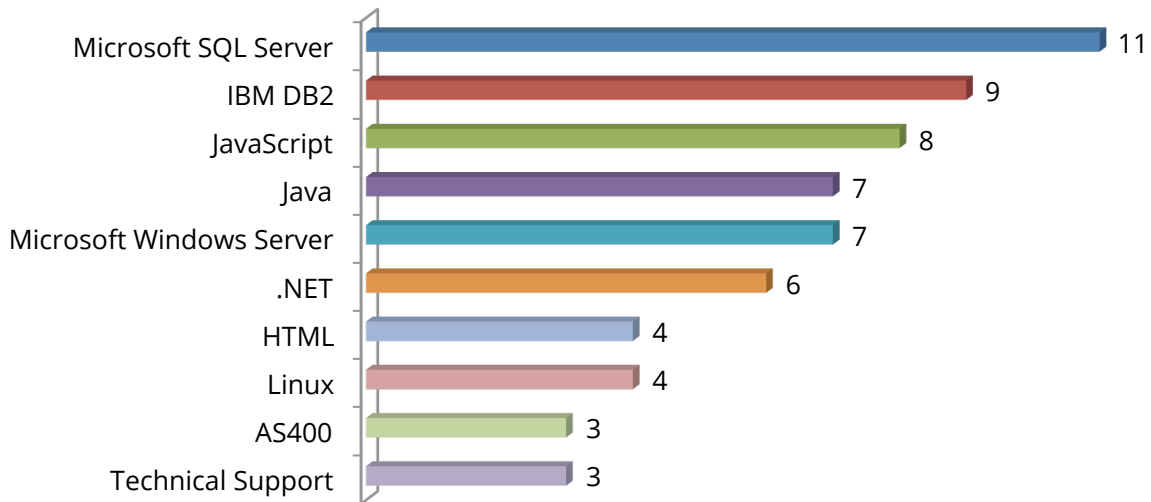
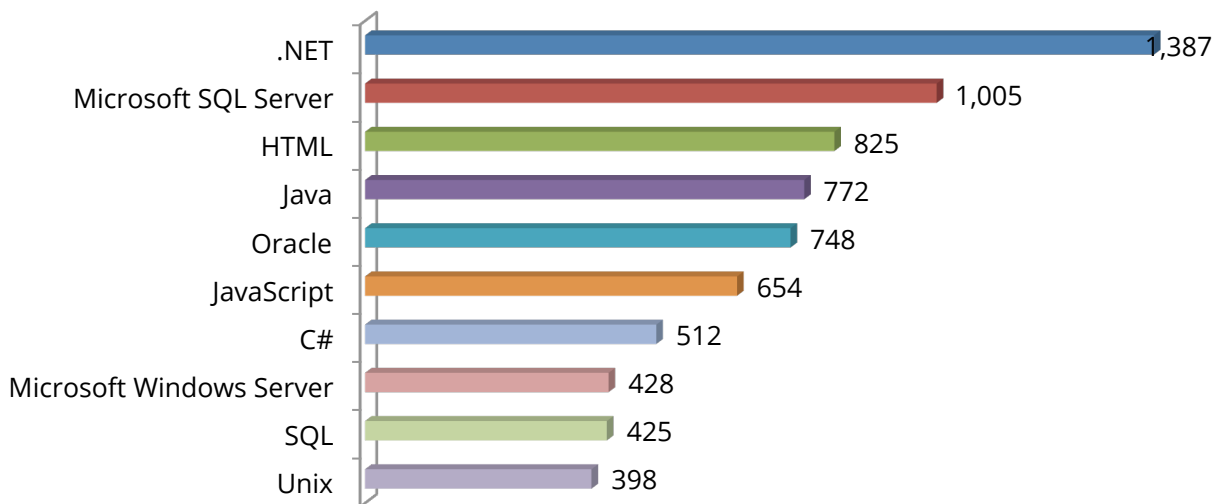


Figure 9: Top IT Job Skills Requested by Staffing Companies



The IT job skills requested by staffing companies were also analyzed. The top IT job skills requested by staffing companies are shown in Figure 9. These top IT job skills include .NET, Microsoft SQL Server, HTML, Java, Oracle, JavaScript, C#, Microsoft Windows Server, SQL, and Unix.

SKILL CLUSTERS

Figure 10: Skill Clusters



In order to discover the IT job skills that commonly occur together, a k-means cluster analysis was performed. Three key clusters were observed, as shown in Figure 10. The first of these skill clusters involved the IT job skill, .NET. The analysis indicated that job ads requesting .NET also commonly requested other IT job skills including HTML, Java, JavaScript, and MySQL. For reporting purposes, the cluster around .NET can be called the Software Development skill cluster. A second skill cluster included the job skill, Technical Support, as well as Microsoft Windows Desktop, Microsoft Windows Server, Linux, Apple Max OS X, and LAN/WAN. This second cluster has been named the Computer Support Specialist skill cluster. The third skill cluster revealed in the analysis included Network Infrastructure, as well as Telecom Infrastructure, Virtualization, VOIP, and Microsoft Windows Server. This third skill cluster can be called Network and Computer Systems Administration.

CONCLUSION

The research presented here demonstrated how the top IT job skills could be found in the real job posting data on Careerlink. In a one year period, those top IT job skills were .NET, Microsoft SQL Server, HTML, Java, JavaScript, Oracle, Microsoft Windows Server, C#, and SQL. The .NET skill category is particularly high on the list as it is inclusive of several .NET sub-skills. The future addition of more detailed .NET skill categories will likely affect subsequent rankings. The data can also be analyzed by various factors including industry type and company size. The results showed that the IT job skills desired by employers in the IT industry varied substantially from those desired in the manufacturing and distribution industry. An analysis of IT job skills by company size showed small variations. Cluster analysis formulated three job skill clusters: (1) software development, (2) computer support specialist, and (3) network and computer systems administration.

Careerlink can be a useful tool in linking skills, jobs, and education. The data from Careerlink job postings can be used to showcase how skills connect to jobs that then connect to education opportunities. A new

feature on Careerlink displays the skills required for the positions, the related career tracks, and local educational courses that teach these skills.

One of the next steps of this research involves updating the skills list and improving the skills interface on Careerlink. In addition, Careerlink will create customized on-demand reporting for each of the community colleges that MCIT serves. A tool to track trending skills will also be created, which would enable colleges to prepare in advance for new developments in workforce labor needs. From a research perspective, a goal is to analyze how this source differs and complements traditional labor-market information. Additionally, it is hoped that this research can be utilized as one of the available tools in the comprehensive effort to strengthen the alignment of skills and educational opportunities to ensure that students are prepared for current jobs.

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