

A Study of Information Technology Job Skills

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ABSTRACT

Compounding the shortage problem for more information technology (IT) workers is the continuous change in cutting edge information technology. Directly affected by these technological changes are the types of skills demanded of IT professionals. The primary purpose of this study is to identify the types of skills demanded of IT professionals. The results of this research indicated that the types of skills required of IT professionals are changing. In addition to human resources administrators, career counselors, corporate trainers, information systems consultants and students, educators will find the outcomes of this study useful for the design and development of new curricula.

INTRODUCTION

Companies and governmental agencies throughout this nation have been scrambling and struggling with the growing worker shortage in the information technology (IT) industry since the end of the last millennium. High technology dependent nations are all reporting difficulty finding skilled computing professionals to fill crucial posts. American universities and colleges have typically responded well to meet the labor needs of the country (Aldoaijy, 1999). However, in the last ten years, universities and colleges have not done a sufficient job educating and training graduates to meet the needs of the IT industry. As a matter of fact, institutions of higher learning are in "a disconnect between what the market needs and what the colleges are providing" (Selingo, 2001, p. A27).

Compounding the shortage problem for more IT workers is the continuous change in cutting edge information technology. In addition to quickening the obsolescence cycle of the existing workforce, the new technologies implemented are causing changes to the fundamental ways that organizations operate (Lee, Trauth, & Farwell, 1995). Directly affected by these technological changes are the types of skills demanded of IT professionals. This is one of the primary reasons that certified IT professionals are constantly attending re-certification programs; lower as well as mid-level employees are returning to schools to take additional computing and management classes in order to get advancement opportunities. Many of these professional development opportunities are encouraged and paid for by employers (Brandel, 2000; Schafer, 2000; Jacobs, 2000).

STATEMENT OF THE PROBLEM

Information technology is the driving force behind the restructuring of many contemporary and competitive organizations (Maier, Clark, & Remington, 1998). As new innovations in IT are assimilated into the workplace, new types of computing skills are demanded of IT professionals. Even though revisions of university curricula for computer information system (CIS) departments have been requested to meet the changes, and they have responded many times, the gap still exists (Kim, 1998; Lee, Trauth, & Farwell, 1995; Maier, Clark, & Remington, 1998).

As a result of the shortage of skilled IT personnel in the labor force, many projects have been set aside or have been delayed. The quality of projects has also decreased. In many cases, the lower quality was brought about by the hiring of less qualified IT workers (Edwards, 2000; Goodwin, 2000).

From a broader perspective, this problem can have national implications. As e-business and the global e-economy continue to expand and change, the shortage of the skilled IT workers can affect the United States economy and this nation's leading role in the IT industry (Aldoaijy, 1999). Furthermore, it can also threaten productivity and affect the growth and recovery of businesses around the world (Cataido, 2000).

STATEMENT OF THE OBJECTIVE

Advances in computing hardware, software, and networks will continue to drive the need for skilled IT workers that can use cutting edge technologies to solve emerging business problems. The types of skills needed by companies are expected to change as new technologies are brought into the market. However, current skills needed by companies are good indicators of the types of IT skills that current and future IT professionals should have in order to be marketable in a competitive labor market.

The primary purpose of this study is to identify the types of skills required of IT professionals. Specifically, this study examined the types of technical skills needed of new employees as disclosed in the one of the most popular Internet job banks, Monster.com. The results of this research should be of interest to human resources administrators, career counselors, corporate trainers, information systems consultants, and agency recruiters. Educators will find the outcomes of this study useful for the design and development of new curricula that can prepare

students for the job market. Students will find this study particularly helpful because the skills identified in this research can have important implications for them in their selection of elective courses and when choosing a track for specialization.

METHODOLOGY

The methodology used to gather the data was relatively similar to three other previous studies that also examined job disclosures. The three studies were Liu, Liu, Koong and Lu (2003), Markey, Liu and Koong (2000), and Arnett, Litecky, and Prabhakar (1998). The study by Liu, Liu, Koong, and Lu (2003) consisted of 300 observations that were collected over a ten-week period from two Web-based databases containing job listings from around the country. The other two studies included data from localized newspapers (Arnett, Litecky, & Prabhakar, 1998) and job listings from only Fortune 500 Company Web sites (Markey, Liu, & Koong, 2000).

The targeted population for this study was IT jobs listed in Monster.com, which is among the top ten e-recruiting providers in the world (Boone & Julian, 2001). On any given day, the number of jobs listed may not be the same because new entries are actually added daily and expired listings are deleted periodically. For this reason, the targeted population for this study is all the job listings on the day of study. Two hundred (rounded from the sample size of 195) jobs were randomly extracted from the data portal. The sample size was based on an estimated proportion of 95 percent from previous studies (Koong, Liu, & Liu, 2002; Liu, Liu, Koong, & Lu, 2003), a confidence level of 90 percent, and an acceptable error rate of 0.02.

To be consistent with previous studies, the types of skills collected included all hardware, software, and networking skills that were reported by Wilkins and Noll (2000), Leslie (2000), and Arnett, Litecky, and Prabhakar (1998). The classification scheme used was modeled after the works of Arnett, Litecky, and Prabhakar (1998), Koong, Liu and Liu (2002), and Liu, Liu, Koong and Lu (2003). The job skills used in this study are divided into five broad categories. Each category is further divided into types of skills. The schematic model used for organizing the data set in this study is presented below:

- Programming Languages: C, C++/Visual C++, Java, Visual Basic, COBOL, and others
- Web Development: Active Server Page, HTML, Java, XML and others
- Database: Oracle, DB2, MS Access, MS SQL Server, and others
- Networking: TCP/IP, IPX, HTTP, and others
- Operating System and Environments: Linux, Solaris, Unix, Windows and others.

FINDINGS

All 200 jobs extracted were found to contain detailed job descriptions so they were all were useful. Using the works of Arnett et al. (1998) and Leslie (2000), the major categories used for classifying the technical skills were Programming Languages, Web Development, Database, Networking, and Operating System and Environments. Each table shows the absolute number of times a certain skill was indicated in the job listings. The percentage is the percent of times a skill was listed in the category.

The Programming Language skills category was broken down into C, C++/Visual C++, Java, Visual Basic, COBOL, and Others. Forty-four or about 22 percent of the jobs listed at least one programming language in the job description. Over 97 percent of the job skills were found to contemporary programming languages. Detailed information about the different types of programming languages was presented in Table 1.

Skill	Number	Percent
C	6	13.64%
C++/Visual C++	17	38.64%
Cobol	1	2.27%
Java	14	31.82%
Visual Basic	6	13.64%
Others	0	0.00%
Total	44	100.00%

Table 1: Skills in Programming Languages Category

The Web Development category was broken down into the following: Active Server Page, HTML, Java, XML and others. This is the category that has the largest number of jobs listed. Fifty-one or about 25.5 percent of the jobs listed at least one Web development skill. XML was a new skill that has surfaced because it was not present as a major requirement that was reported in previous studies. Other details were presented in Table 2.

Skill	Number	Percent
Java	25	49.02%
XML	11	21.57%
HTML	10	19.61%
Active Server Page	5	9.80%
Others	0	0.00%
Total	51	100.00%

Table 2: Skills in Web Development Category

The Database category was also broken down into five skills: Oracle, DB2, MS Access, MS SQL Server, and others. Oracle was the leading type of database skill required. Almost 65 percent of the job skills were Oracle related. The two Microsoft products, SQL Server and Access, accounted for about 6% of the database job skills identified. Thirty-one or about 15.5 percent of the jobs required some type of a database skill. Detailed information about the different types of skills in the Database category was presented in Table 3.

Skill	Number	Percent
DB2	9	29.03%
MS Access	1	3.23%
MS SQL Server	1	3.23%
Oracle	20	64.52%
Others	0	0.00%
Total	31	100.00%

Table 3: Skills in Database Category

The Networking category was broken down into the following: TCP/IP, IPX, HTTP, and others. This category has the least number of jobs listed. There were only 7 jobs identified in the three sub-categories. According to the findings, over 57 percent of the job skills were related to TCP/IP. Detailed information about the other Networking skills was presented in Table 4.

Skill	Number	Percent
TCP/IP	4	57.14%
IPX	2	28.57%
HTTP	1	14.29%
Others	0	0.00%
Total	7	100.00%

Table 4: Skills in Networking Category

The Operating System and Environments category was broken down into Linux, Solaris, Unix, Windows and others. Thirty-two or some 16 percent of the jobs require some knowledge of the operating system. One type of Operating System and Environments skills, Unix, dominated this category. Over 56 percent of the job skill was Unix related. Detailed information about the different skills in Operating System and Environments was presented in Table 5.

Skill	Number	Percent
Linux	6	18.75%
Solaris	1	3.13%
Unix	18	56.25%
Windows	7	21.88%
Others	0	0.00%
Total	32	100.00%

Table 5: Skills in Operating System and Environments Category

There were a few other major observations about the skills found in Table 5.

1. Besides Unix, the next in demand operating system and environments skills listed were the Microsoft Windows products. The recently popular operating system, Linux, came in third.

2. Unlike previous studies (Arnett, Litecky, & Prabhakar, 1998; Leslie, 2000), there were no OS/2 skills needed. In other words, there was no demand for IBM related operating systems skills found.

In addition to those five broad categories, the study also found that Project Management skill was in demand. It was listed in 57 of the 200 jobs extracted from Monster.com. Another observation was that companies desired their new employees to have prior job experiences (190 out of 200) and good communication skills (94 out of 200).

The category proportions were also not equally distributed. There are five categories of job skills that were examined. Based on the tallied results and computed percentages, two of the categories have substantially more jobs available. Web Development and Programming Languages account for almost half of all the job skills identified. The three categories, Database, Networking, and Operating Systems and Environments account for the rest of the major job listings. One new skill category, project management was listed as a multi-skill requirement in over a quarter of the jobs extracted.

CONCLUSIONS AND IMPLICATIONS

This study found many similarities in outcomes with previous studies. For example, many of the types of job skills identified by Markey, Liu, and Koong (2000), Leslie (2000), Wilkins and Noll (2000), and Arnett et al. (1998) were found in the jobs extracted from Monster.com. There was one major difference. The contemporary programming languages and Web development skills had increased in importance and the traditional programming skills had decreased in demand. For educators who have already integrated the contemporary programming tools into the curriculum, they may only need updated versions of those instructional systems. For faculty members teaching courses in the areas of computer systems organization, hardware and software evaluation, networking, and data communications, the results of this study suggest that there may be a need for aligning course content to technologies that are growing in importance. In the jobs extracted, Unix and Windows are the two operating systems that are in demand by employers. These trends can be expected to continue because Unix is a portable operating system. In addition, Microsoft Windows market share is also expected to grow in the coming year because their operating system has dynamic capabilities and is extremely user-friendly.

Current students in information systems and computer related degree programs may want to prepare for the job market by taking courses that require them to master a diversity of job skills and tools. Ideally, students should have a working knowledge of contemporary programming languages and Web development tools because these two categories of skills were indicated in some 58 percent of the jobs.

Finally, this study found that the online databases appear to be equally good sources for finding computer related job information. The important fact is that there are lots of e-recruiters using the new technology for targeting job candidates and the Web is the new medium for prospective IT applicants and employers to better reach each other. Educators may want to encourage their students to include this medium in their job search strategies when providing advisement about career opportunities.

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