
A Quantitative Analysis of Computing Jobs in 2012

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Abstract

University degrees provide a foundational education that can have long reaching application for both personal and professional purposes. However, will a degree by itself lead to an information technology job in today's competitive market place for top rated computing companies? This study updates one undertaken in 2010 and addresses education and experience requirements and the need for a professional certification as required for job vacancies in "Information Technology" advertised by one hundred of the top firms among the Computerworld's *Best 100 Places to Work in IT 2012*. The findings suggest two percent of the openings required a Master's degree. Bachelor's degrees are required for nearly 70 percent of the jobs, and experience is almost universally specified in job announcements. Data will provide interesting insights into the job market and suggest a number of inferences that one might make as well as opportunities for additional research.

Keywords: job postings, experience, degrees, certifications

1. INTRODUCTION

There is an abundance of both undergraduate and graduate degrees commonly available in various information technology programs. This accessibility may sometimes make it difficult to determine what type of degree program, if any, to pursue for future job considerations in the computing field. Arguably, experience in the field of computing is increasingly important, and sometimes certifications are required where a formal bachelors or master's degree, once done, rely on information that rapidly becomes outdated. Yet the need for computing professionals continues to rise across industries.

This research is an exploratory quantitative study reporting on whether a randomly selected group of top 100 companies is looking for a bachelor's degree for job consideration and/or looking more for experience and certification.

The decision to investigate the top 100 companies was somewhat arbitrarily chosen while recognizing many participants in the IT industry are independent small businesses providing a rich variety of functions for customers they serve. Similarly, this sector accounts for a sizeable portion of the IT workforce growth and constitute many start-up and small and medium-sized information technology firms. (CompTIA, 2011)

Over the years, there have been a number of previous studies which have looked at parameters for hiring individuals (Adelman, 2000), (Hunsinger, 2009), (Randall and Zirkle, 2005). This study will examine the job qualifications in 2012 for computing positions advertised by 100 companies as found in the "Best Places to Work in IT" according to Computerworld. The paper categorizes job requirements into degrees required, experiences

needed, and certifications necessary for job employment.

Please note that the term "information technology" nowadays appears to refer mainly to technology and business applications of computing. While this may be arguable, Denning and Frailey suggest that oftentimes the term "computing" is now the preferred term. (Denning and Frailey, 2011)

2. LITERATURE REVIEW

Industry Needs/Requirements

A report by the Bureau of Labor Statistics (BLS, 2009) stated that those working in the computing field exceed three million workers. In a survey a year later, (Computerworld, 2010a) (2010b) data indicates that of the 2,090 manager level respondents, 47 percent indicated they would hire new computing personnel in the coming year. Anticipating top jobs between 2008 and 2018, the BLS stated at the Associates level, there would be 235,000 job openings for computer support specialists; a need for 153,000 at the bachelor's degree level for computer software engineers, systems software; 208,000 network systems and data communications analysts; 218,000 computer software engineers, applications; 223,000 computer systems analysts.

In attempting to identify the number of IT workers in the United States, one must be careful, as there are many sources and many conflicts due to parameters surrounding individual studies and published numbers. Debates rage on. Data has long been collected by the Bureau of Labor Statistics, as cited in the previous paragraph. But reports generated by the Information Technology Association of America (ITAA) representing some 11,000 trade companies, mirrored by Department of Commerce's Office of Technology Policy reflect different numbers, and, in the past, the General Accounting Office (GAO) criticized the methodology used to gather data put forth by both of these agencies. Criticisms center on sample size, response rates, and more. (CRA, 2004)

While it is difficult to arrive at a firm number of IT workers in the United States due to a host of limitations, a recent report by CompTIA in 2011 claims "the core IT industry directly accounts for approximately 5 million jobs in the United States." (CompTIA, 2011)

Given all these large numbers, Whitcomb states an average of eight job seekers compete for every open position, and employers can be very selective in whom they choose for their vacancies. "Chances are you don't possess all the criteria the hiring manager seeks in a candidate. This means you'll have to address your "deficiencies" during the job interview" (Whitcomb, 2010). Though it is possible a company will not directly interview a large number of applicants, those contacted would know they were in consideration based on their resume.

Information World reported on The State of IT jobs early in 2010. Needs centered on Java, .Net, testing, IT server administration, databases, web application development and help desk and general computing support. Hot jobs for 2010-2012 were projected and have been borne out to include security, collaboration technologies, and orchestration and virtualization (servers and storage currently and desktop projected). Some older skills were also identified for the next few years including ITIL, Six Sigma and Lean-IT management skills, project management, business analytics, and business intelligence (Gruman, 2009).

A study published by Partnership for Public Service in August 2010 reported on the assessment of governmental job applicants (Partnership and PDRI, 2010):

Agencies view assessment too narrowly and miss out on good candidates. There is a tendency to think that assessment is confined just to the formal process of measuring applicant competencies. As a Partnership for Public Service result, HR and hiring managers may pay too little attention to other important parts of the process, including ensuring that job requirements are clear, that reference checks are conducted properly, and that they use the probationary period to validate hiring decisions.

Hoyle (2010) states the value of an individual within any organization is influenced by various factors to include formal education, certifications, and peer respect. Ang, Change, and Slaughter offer: "In totality, we find that experienced IT professionals performed better

than novices by providing a significantly larger repertoire of responses [to questions], taking significantly less time in generating this larger repertoire, and providing responses that were of significantly higher quality." Many individual skill sets [that applicants possess] not only contain the technology skills but also more business skills as they mature. (Joseph, Ang, Change, and Slaughter, 2010)

For management, Weston reports computing managers need to grow within the business from the traditional operations, suggesting seven key skills which managers should exhibit:

1. Balance specialization and cross-functional expertise
2. Become an arbiter of risk
3. Build strong working relationships
4. Embrace analytics
5. Embrace enterprise architecture
6. Move from project management to program management
7. Actively communicate (Weston, 2010)

Education

There is a great deal of literature dealing with various information technology programs available at all levels of formal education ranging from bachelors to doctoral programs. Interestingly, many computing professionals routinely state that their degree has not been the key to their success, but rather specific knowledge a job requires.

In 2010, the Bureau of Labor Statistics (BLS, 2010) discovered some managers of information systems obtained positions with an associates or trade school degree, provided they had significant experience and continued to obtain skills on the job. In contrast to the latest data, Adelman in an earlier paper reported only 20 percent of job listings asked for college degrees, and further disclosed certifications were increasing in popularity. Adelman also discovered that many individuals matriculate to IT from the business side; others advance though the organization's "technical side." (Adelman, 2000)

Professional Certifications

Professional certifications provide specialized skill sets. There are some who feel it important while others state it is more valued by human resource managers than computing supervisors

Employees sometimes need to demonstrate specific software or technology knowledge. Some times this may be demonstrated though professional certifications. "Although not required for most computer and information systems management positions, certification demonstrates an area of expertise, and can increase an applicant's chance of employment. These high-level certifications are often product-specific, and are generally administrated by software or hardware companies rather than independent organizations" (Perkins, 2010).

According to the Global Knowledge and Tech Republic study (BLS, 2010), 12.9 percent of those surveyed received a raise through development of a new skill set or acquired certifications. The study also reported Project Management Professional (PMP) certification was among the most popular and could well result in higher pay. A prospective employee would experience increased marketability in the workforce if they possess a combination of both education and certifications.

Hunsinger suggests evaluation of certifications should be addressed in the hiring practice (Hunsinger, 2009) as certification programs can validate a specific skill set (Hoyle, 2010). According to de Reave (de Reave, 2008), certifications can also be viewed as a professional development activity to maintain job satisfaction. He states, "For IT, diversity is an asset that keeps the organization fresh, engaged and ready to accomplish the rapid pace of change" But Tillman claims certifications are self-limiting to a period of time received and that technology change occurs too rapidly for long term value to be gained in the workplace environment (Tillman, 2010) Foote found twenty-five certifications that increase marketability, while emphasizing market conditions (Foote, 2010). This tends to make it difficult to evaluate the worth of certification actions. In contrast, certification importance was reported to be on the decline by Hunsinger (Hunsinger, 2009).

De Reave, and Hoyle both say that certifications reflect current skills knowledge beyond college degrees (de Reave, 2008) (Hoyle, 2010), while Perkins says that it is not a question of getting a certification, but which specific one(s) (Perkins, 2010). Approximately 6.5 million people in the U. S. hold a computer certification, and this number is expected to dramatically increase. Many individuals are unable to attend a

protracted college education to obtain a degree but may successfully pursue a certification. Interestingly, it has also been asserted that there are many computing teams whose members lack any certifications, and yet are considered quite effective and perhaps more effective than certified practitioners.

Certification (n = 240)	Number	Percent
Microsoft Certified Professional (MCP)	67	27.9 %
Microsoft Certified Administrator (MCSA)	65	27.1%
Microsoft Certified Systems Engineer MCSE)	51	21.3%
Microsoft Certified Database Administrator	45	18.7%
Cisco Certified Networking Associate (CCNA)	41	17.1%
Network+	33	13.8%
Cisco Certified Networking Professional (CCNP)	25	10.4%
Oracle Certified Professional Database Administrator (OCP DBA)	23	9.6%
Certified Novell Administrator (CNA)	21	8.8%
Microsoft Certified Systems Developer (MCSA)	20	8.3%

Table 1: Certifications Desired by Hiring Persons (Hunsinger, 2009)

No one disputes that technology changes occur rapidly and the difficulty in keeping current with skills necessary to remain effective. Certifications often provide skills meeting some industry needs, and many companies seek professionals with these credentials. A survey mostly completed by the Society of Human Resources Managers (SHRM) members who were planning on hiring new computing personnel in the United States presented compiled data from 240 surveys reporting on certification needs. Of these, over 85 percent of the respondents claimed to request at least one

certification for new employees while just over 50 percent expressed desire for at least two certifications (Hunsinger, 2009). Table 1 presents popular certifications addressed. Studies in 2012 (ahead) do not expand upon this observation. The Partnership for Public Services determined human resource (HR) managers had limited ability to assist managers with their hiring and/or assessment needs. (Partnership and PDRI, 2010) Moreover, HR professionals appear to value certifications more highly than computing professionals

The HR managers can use certification documentation as a baseline for related positions, (Randall and Zierkle, 2005). It appears to be easy for HR and technicians to evaluate certifications, since it represents a readily identifiable capability as compared to what might be evaluated for experience levels or even education.

3. RESEARCH METHODOLOGY

Given this backdrop a new quantitative study was undertaken using secondary data obtained from the *Computerworld's* 2012 Best Places to Work in IT in order to update the 2010 data. All one hundred companies were researched. In accessing the career center for each of these 100 companies, a search on "information technology" was selected. (Constraint: data only for the United States was considered.)

To support this research, a random number generator was used www.random.org to

- 1) Choose how many jobs would be evaluated for each of the 100 companies (On the day of data gathering, 5132 were listed under "IT" hence N = 5132)
- 2) Once the company web site was accessed, a second random number generation was undertaken to determine which job announcements for the selected companies would be used in this study. (Sample n=432).

Example: one company had 17 IT jobs posted. Based the first random number generation two of these seventeen would be sampled for this company. The second use of the random numbers was used to indicate which of two numbers (for this company) between one and seventeen would be sampled. Another example: another company listed 32 jobs in IS. Four

random numbers were generated in the range of 1-32, and postings 3, 9, 14, and 30 were studied.

The number sampled per company and the specific job postings for each company thus varied with random number generation. This procedure was undertaken for each of the 100 companies, where 432 job postings constituted the sample.

Random sample number determination as stated by Krejcie and Morgan suggests that for this population, the random sample size should be between 357 and 375. This study collected data from 432 job postings which exceed the amount required. (Krejcie and Morgan, 1970)

On the day of data gathering, a few of the 100 Best Companies did not have jobs posted and were thus not considered for further investigation. For example, DTE Energy, Jack Henry & Associates, Inc., Northwestern Mutual, Penn National Insurance, Altria Client Services Corp, and American Water (rankings numbers 34, 60, 67, 78, 87 and 95 respectively) were thus excluded.

It is important to note that while the search was based on "information technology," many companies frame their job announcements in different ways. While 'IT' was the starting point, General Mills (Company #4) called their interests: Information Systems; Lehigh Valley Health (Company #7) Network Technical/Professional; Securian Financial Group (Company #10) Technology; University of Pennsylvania (Company #11) Information Systems / Information Technology; Cedars-Sinai Health System (Company #13) Information Technology / Telecommunication; SAS (Company #14) Information Systems; Sacramento Municipal Utility District (Company #24) Information Technology / Telecommunication; American Fidelity Assurance Co (Company #27) Information Systems; CDW (Company #30) Engineering Solutions / Architecture /Project Management, etc.

Job postings from these sites were evaluated for required educational level, years of experience and professional certifications.

4. RESULTS

The information obtained was analyzed based on information companies included in the "academic requirements" for employment in the Best Places to work reference. Table 2 focuses on degree requirements, as found in the 432 job announcements investigated.

Degree Requirements

Degree Required	Raw Number	Percentage
No Degree Mentioned	47	11
High School Diploma	15	3
Associates Degree	4	3
Bachelors Degree or Equivalent	151	35
Technical Bachelors Required	75	17
Bachelors Required	70	16
Masters Required	10	2
Masters Preferred	48	11
Doctorate	2	0.5

Table 2: Degree Requirements (N=5143, n=432)

While this current study found 35 percent of postings required a "bachelors or equivalent," 33 percent required a bachelors' degree (17 requiring a technical bachelors, 16 percent a wider range of bachelor degrees), three percent require an associate's degree and three percent a high school diploma. Additionally there were 11 percent specifically stating they preferred a Masters, two percent specifically requiring Masters and an additional 0.5 percent requiring a Doctorate.

Experience Requirements

Table 3 indicates that experience was required in 81 percent of the jobs evaluated as compared to 85 percent reported by Robin (Robin, 2011). It is important to note that 56 jobs (13 percent)

announcements did not mention experience in specific years but did require experience.

Years	Number	Percentage
0	26	6
1	25	6
2	61	14
3	68	16
4	26	6
5	83	19
6	15	3.5
7	26	6
8	15	3.5
9	5	1
10	13	3
11	0	0
12	8	2
13	1	.25
14	0	0
15	4	1
Not Mentioned in Years	56	13

Table 3: Experience in Years (N=5143, n=432)

In total, then, 376 (87 percent) of the 432 jobs reviewed listed experience required while 56 (13 percent) had no experience requirements

Certification Requirements

Category	Response	Percent age
No certification mentioned	361	83
Certification Required	36	8
Certification desired	35	8

Table 4: Certification Requirements (N=5143; n=432)

The final analysis presented in Table 4 shows that eight percent require certification and an additional eight percent would prefer applicants with some specified certification. The majority (83%) did not require any certification. Robin found that 14.4 percent required certifications from the 2010 job announcements reviewed but did not report on the certifications "desired" category. (Robin, 2011) The required certifications went from 14.4 in 2010 to 8 percent in 2012 showing a decline of 7 percent.

Denning & Frailey reported "A growing number of computing jobs require specialized certifications such as Microsoft or Cisco network engineer", while they also note that most

certifications tending to focus on sub-professionals. (Denning and Frailey, 2011) Certifications can be independent of college degrees while allowing an individual to show skills easy to recognize in the hiring process (Huntsinger & Smith 2009). The certification can be used a discriminator when evaluating new candidates for employment (Prabhaker, Litecky & Arnett, 2005).

5. LIMITATIONS

The job counts in the previous tables totaled over 400 job opening descriptions for 100 top companies. Though many factors were listed in the job announcements, only the required degree, years of experience and possession of professional certification were captured in this study. The focus of paper did not include specific skill sets by design. This was intended to provide a reasonable paper scope.

While the paper focused on the top 100 companies, it is common knowledge that many computing professionals work at 'smaller' organizations where requirements for degrees, experience, and certifications may be lesser than those of larger firms. According to CompTIA, "Many participants in the IT industry are independent small businesses that provide a variety of functions for customers they serve. A sizeable portion of anticipated work force growth will emanate from start-up and small- and medium-sized information technology firms. There are an estimated 400,000 self-employed IT industry workers not classified as business establishments by the U.S. Census Bureau Economic Census but, nonetheless, provide meaningful employment and services throughout the country." (CompTIA, 2011)

That a graduate degree is less in demand may be attributed from the nature of the data gathered and the sources investigated. Job requirements for those holding graduate degrees imply a need for more specialization and perhaps experience, and positions are likely fewer in numbers than those positions requiring less education and experience.

6. CONCLUSIONS AND INFERENCES

Results presented have important implications to future analyses by job researchers and rising computer professionals. Conclusions made are based on data gathered from well-regarded, 'top' companies the results of which might be

indicative of needs of a larger population of major companies.

First of all, it is noteworthy that with rare exception, the data clearly indicates that a graduate degree is not required by the companies investigated to the extent experience is when seeking employment. One can speculate why this is so. It may be that jobs requiring specialized and/or advanced degrees may be solicited or advertised differently than jobs typically posted in *Computerworld*. Then too, employers seeking advanced degree holders might also be looking for higher levels of enterprise / corporate level experiences. This suggestion represents an additional opportunity for research in job postings for advanced degree holders.

Secondly, data gathered also suggests that while a bachelor's degree is often necessary for many job openings there is also a supplementary requirement to have experience. Thus employer need may make it difficult for many to qualify for many job postings under the strict interpretation of such postings. Clearly, applicants possessing a degree coupled with experience appear to have a significantly greater likelihood of employment.

Even though some might argue that common knowledge indicates that two to three years experience results in 30% of the hires, our research finding is that five years experience seems to be the norm. Then too, it is common for many computing graduates to gain successful employment with their degree and no experience.

Still another interesting finding is that of the many job postings investigated 83% cited no requirement for certification. If one contrasts this with the employment requirement for 68% to hold a bachelor's degree, then one might infer that holding a degree is nearly essential and certifications are of significantly lesser importance.

Because the vast number of job postings specifies an applicant with experience, a significant inference one might nevertheless make is that a rising computing professional may be more marketable by undertaking an internship in a company somewhere near the end of a bachelor's program. Experience with many students supports this conclusion, as many secure employment upon graduation.

Further (anecdotally), students seem to enjoy the challenge of contributing within a real work force, ability to apply their education in a workplace, and earn real income. Further, the student gains valuable, on-the-job experience: company may evaluate individual's performance and suitability; individual may similarly experience (or not) a comfort level with the company. Clearly, this is a win-win scenario.

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