

Can We Make Better Use of the Educational System To Solve the Information Technology Staffing Problem?

William K. Davies
Emergent Information Technologies
Vienna, VA
keith.davies@emergent-it.com

Rick Gibson, Ph.D.
Department of Computer Science and Information Systems
American University
Washington, DC
rgibson@american.edu

Abstract

This study investigates whether we can use the secondary and post-secondary educational system to solve the IT staffing problem. In order to reach this determination, the study performs a review of the literature. This study is limited in scope to secondary and post-secondary academic institutions located within the United States. This study will use information gathered from various academic institutions such as the Information Technology Association of America (ITAA), the Applied Information Management (AIM) Institute, and the Detroit School of Industrial Arts (DSIA). Within the ITAA, the School-to-Career (STC) program will also be examined. In determining solutions to the IT labor shortage, this study will investigate the level of cooperation that must exist between academia and industry in order for a solution to be achieved. Finally, this study will touch on whether the cooperative solutions that are derived from the cooperation between academia and industry are slanted towards the larger corporations. This is occurring because the smaller corporations do not have the available resources to share with various academic institutions. This results in a solution to the problem that is skewed towards the larger companies. This study concludes that further research must be done in order to determine which of the proposed solutions will have the greatest impact on solving the IT labor shortage, however, it is apparent that any solution must involve industry and academia working together.

Keywords: IT staffing problem, worker shortage, industry/education cooperation

compounded by the fact that only 30,000 college graduates per year are entering the workforce (Dillon &

1. BACKGROUND

The sweep of digital technologies and the transformation to a knowledge-based economy have created a robust demand for workers highly skilled in the use of information technology. This shortage is documented in a recent study that stated that last year's demand for IT professionals will exceed the number of available workers by 400,000 jobs. Additionally, the number of unfilled jobs in 2005 is projected to reach an estimated 1.2 million. This shortage of IT workers is further

Cole-Gomolski, 1999). These figures are backed up by several other studies including one by Jaleshgari (1999) that reported that the IT labor shortage has cost the U.S. economy \$105.5 billion annually. Jaleshgari further found that roughly 10% of IT service and support jobs remain unfilled. This current shortage of IT workers can be attributed in large part to the explosion of new jobs that have been created within this field. In fact, the U.S. Department of Commerce notes that between 1983 and

1998, the number of IT workers has increased 190% (Mateyaschuk, 1999).

With this increase in the number of jobs, the supply of IT workers cannot keep pace with the demand and, as the above data note, this problem is only getting worse. It is critical to find a solution to this problem because, if allowed to continue, the shortage of workers will have a detrimental effect on the entire U.S. economy (Jaleshgar, 1999). As Secretary of Commerce William Daley states, "there's no question that if you don't have people properly trained for the future, it will affect our economy. If the need for IT workers isn't addressed, it could have a sizable impact on our economy because information technology, such as E-commerce, is playing such a tremendous part in our economic explosion" (Mateyaschuk, 1999, p. 1). These statements take on even more significance when one considers the role that the IT industry has had in the past growth of the U.S. economy. Between 1995 and 1997, IT was responsible for more than a third of the overall growth, and since World War II, information technology has accounted for almost half of the nation's long-term growth (Mateyaschuk, 1999). The Information Technology Association of America (ITAA) has conducted studies on the effects of the IT labor shortage and has found the effects to include "slowed growth in IT-dependent industries, increased outsourcing overseas, and a decreased supply of technology goods and services that our citizens enjoy" (<http://www.ita.org/workforce/buildlink/htm>, 19 Feb. 2000). The IT labor shortage affects not only the IT industry but the whole country as well. Increasingly, more and more Americans depend on IT for how they do their jobs.

Obviously, there needs to be a resolution to the problem of inadequate IT staffing. This study will attempt to show that a solution can be achieved by utilizing the secondary and post-secondary educational systems of this country. This solution can be achieved by using the educational systems to increase students' interests as well as develop the skills that are needed in today's IT environment.

At the secondary educational level, increasing students' interest in IT could translate into a greater number of students entering college and university with IT majors. Another benefit from increasing students' awareness of IT at the secondary educational level would involve the possibility of high school students taking jobs in the IT industry either over the summer or after school. This would have a direct effect on decreasing the labor shortage. Students would also benefit from learning IT skills during their secondary educational years. This would make them more attractive candidates to firms looking to hire temporary summer employees and interns. Additionally, learning these skills during high school would give the students a head start on skills that would be necessary for college.

At the post-secondary level, increasing students' interest in IT would help ensure that these students maintain their current plans to become future IT workers. Additionally, developing the skills that college and university students need for their future jobs in the IT industry makes them more attractive to future employers. This is because their on-the-job training can be substantially reduced.

The key to these solutions is the cooperation and partnership that needs to exist between education and industry. This partnership is already a key ingredient in some of the existing efforts among education and industry. One example involves a task force set up to improve the responsiveness between industry and higher, post-secondary, education (Skinner, 19 Feb. 2000). One of the issues addressed by the task force involves the responsiveness between higher education and industry when addressing the challenges in training qualified IT professionals. If education and industry are to work together to create a solution to this problem, they must both be responsive to the other's needs. Education must be teaching the skills that IT corporations are looking for. Likewise, it is the responsibility of these corporations to inform the various colleges and universities of the skills that they are looking for. The task force study compared the response times of various academic institutions and found several advantages with the private institutions, two-year colleges, and non-degree programs (Skinner, 19 Feb. 2000). Since these educational institutions are better able to modify their curriculum and create new programs, they are better able to keep up with the pace of technology and, therefore, better suited to meet the needs of industry.

There are also partnerships between industry and secondary education. One example of this is the "High Skills" program that is taking place in Boson area high schools (Shein, 30 Aug. 1998). This program is designed to lessen the IT shortage by exposing high school students to various IT technologies and allowing them to go into the work place and use their newly acquired skills. One student in this program used the knowledge learned to get an internship during the summer before college. This student viewed the experience as an opportunity to determine the skills necessary for obtaining and succeeding in today's workplace. (Shein, 30 Aug. 1998). Allowing high school students to be exposed to IT skills before graduating from high school gives them a chance to set career goals during their post-secondary educational years. Industry is playing a major role in the success of this project. Oracle Corporation has provided the high schools in this program with a customer list so that they could contact businesses that are using the Oracle technology to see about internships. Another benefit of this partnership between education and industry has been job shadowing. Job shadowing is when students

from participating high schools go into various companies and follow someone around who is doing a technical job they are interested in (Shein, 30 Aug. 1998). This has allowed students to see how the skills that they are learning in school can be applied in a corporate environment.

Another program designed to give high school students a greater understanding of the IT field is the school-to-careers/school-to-work (STC) program sponsored by the ITAA. STC allows high school students to spend extended periods of time at a worksite in order to learn more about a particular occupation (<http://www.ita.org/workforce/programs/stw2.htm>, 19 Feb. 2000). This program gives students the opportunity to relate their classroom learning to practical applications in the workplace (<http://www.ita.org/workforce/programs/stw2.htm>, 19 Feb. 2000). STC also incorporates job shadowing into their program. The STC has found that this helps students to understand what skills and knowledge will be required for success in today's corporations. STC views the key to their success as being "the involvement of students in a sequence of activities through high school and college that help them explore IT opportunities and make informed academic career decisions"

(<http://www.ita.org/workforce/programs/stw2.htm>, 19 Feb. 2000, p. 2). Those involved with the STC believe that students need to understand the challenges and rewards of working in the IT industry. One way to make this possible is by allowing students visibility into corporate IT workplaces. STC, through its partnership with industry, is making this possible.

The focus of this paper is on using our secondary and post-secondary educational system in order to determine a method for reducing the IT labor shortage. In order to achieve a reduction in the IT labor shortage, this study advocates modifying the current educational set up that exists in this country's schools, colleges, and universities. This could be achieved by modifying the current secondary and post-secondary curricula through an increased partnership between education and industry. If this is accomplished, this study expects to find students that are more educated about the IT field. This study further expects that this increased education would allow students to better understand the contributions that they can make in the field. This increased knowledge would pull students into IT that may not have originally been interested in IT. Additionally, increasing students' exposure to IT at an earlier age allows for them to work in the industry before they normally would be able to. This not only reduces the IT labor shortage, but it also gives students increased exposure to the corporate environment that exists within IT corporations. This study's expectation for the success of such a strategy is based on the success of programs such as the ITAA pilot programs already created in many high schools

(<http://www.ita.org/workforce/programs/stw6.htm>, 19 Feb. 2000). The successes of these pilot programs could be expanded to the state level and ultimately the entire country. The same holds true for the current college and university pilot programs. Their successes can be expanded upon to include other collegiate institutions as well.

2. METHOD

This study examined students in both secondary and post-secondary educational systems. The population of students in these programs was randomly distributed among both males and females. The economic standing of these participants however was skewed towards the upper end. This was especially evident among the post-secondary programs where access to the programs often required admittance into a four-year post-secondary institution. The secondary educational level was much more evenly distributed. Part of this is due to the efforts of organizations such as the ITAA who have been instrumental in creating programs for low-income families (<http://www.ita.org/workforce/techworld.htm>, 19 Feb. 2000). The study is also slanted towards secondary educational programs due to an increased amount of documentation in this area.

Materials

The materials used in this study are the various curricula used by the secondary and post-secondary institutions mentioned. Additional programs that expose students to the IT workplace have supplemented some of these curriculums. Some of these programs include internships, school-to-work programs, and job shadowing (<http://www.ita.org/workforce/programs/stw2.htm>, 19 Feb. 2000).

Procedure

The method of research used in this study is a review of the literature. This literature has been gathered from various sites on the Internet. These sites include secondary and post-secondary institutions that have implemented curricula for improving the training of IT workers. A main source of research material has been the ITAA who have partnered with many institutions to create programs devoted to using education in order to solve the IT labor shortage (<http://www.ita.org/workforce/programs/stw6.htm>, 19 Feb. 2000). After gathering the available research, the next step was to review the various practices employed by each institution. These practices were then reviewed for their effectiveness and impact on the IT labor shortage. The effective practices were then analyzed in order to determine a pattern for how to best increase the flow of IT workers into the workforce.

3. RESULTS

The results of the data uncovered will be split into two sections, one for secondary education and one for post-secondary education. There are some similarities between the two educational levels and these will be discussed in a concluding paragraph.

Secondary Education

The data for secondary education comes from nine sources located throughout the United States. Each site had a goal of better preparing students for careers in the IT field, however, the approaches of these sites can be broken up into four different approaches.

One approach advocated by Tech Corps, Techworld, the High Schools High Skills program, STC, and AIM depends very heavily on businesses. In this approach, corporations are required to supply resources for teaching classes, determine the IT curriculum, and provide job shadowing. Additionally, these corporations are expected to provide students with internship opportunities where various employees within the corporations function as mentors to the interning students
<http://www.ita.org/workforce/studies/image.htm>, 5 Mar. 2000).

A second approach used by the DSIA still involves industry but to a lesser extent. In this program, industry provides funding, but the curriculum is determined by an independent company
<http://www.ita.org/workforce/studies/image.htm>, 5 Mar. 2000). In this program corporations are not expected to provide support via either job shadowing or internships for students.

Junior Achievement and the Building Linkages in IT program favor a third approach. Their approach uses even less involvement with industry. The Building Linkages in IT program creates a model for other secondary educational schools to follow by associating desired IT skills with academic learning
<http://www.ita.org/workforce/buildlink/htm>, 19 Feb. 2000). The Junior Achievement program is similar to the Building Linkages program in that it is also less dependent on industry for input. The purpose of Junior Achievement is to “educate and inspire young people to value free enterprise, understand business and economics and be workforce ready”
<http://www.ita.org/workforce/studies/image.htm>, 5 Mar. 2000, p. 4). In an effort to ensure that students venturing into the IT industry are workforce ready, Junior Achievement is adding an IT dimension to their program. This program is different from others because although IT issues are discussed, the students are not integrated into existing IT corporations. Instead, students gain their workforce experience by creating

their own IT corporations which produce a product in a simulated economy.

The fourth approach, used by Clinton County in upstate New York, is called Learn to Earn. This approach does not require any involvement on the part of industry. Instead, the Learn to Earn program focuses on increasing the attractiveness of IT jobs
<http://www.ita.org/workforce/studies/image.htm>, 5 Mar. 2000). This is done through a campaign to provide information on the IT industry to parents, students, guidance offices, and libraries. Unlike the other programs, the Learn to Earn program has a sole objective of increasing the attractiveness of IT jobs. It does not attempt to train or place students, only to educate them on the benefits of a career in the IT industry.

Post-Secondary Education

The data for post-secondary education comes from four sources, which are also located throughout the United States. These four educational institutions can be broken down into three categories.

The first category is the post-secondary institutions that are the most tightly coupled with industry. The task force on higher education and industry responsiveness fits into this category. This group views the collaboration between business and post-education as being critical in order to effectively train students (Skinner, 19 Feb. 2000). The task force further notes that higher education and industry work best when education is creating programs to give students practical experience. Some of the methods for obtaining this practical experience include offering special degree programs catered to the latest technology, having IT experts on university advisory boards to help shape the direction of the curricula, and internship opportunities with various IT corporations. Another idea that the task force suggests is a clearinghouse where industry and businesses can provide input about what topics an IT curriculum should contain. This clearinghouse would contain information that universities and colleges would use when creating an IT curriculum. Additionally, it is the hope of the task force that academia and industry would collaborate in setting up the information contained within the clearinghouse.

The second category includes academic institutions representing the opposite approach as that employed by the above task force. This approach allows for much looser ties to various businesses. One example of an institution in this category is the fictitious ITAA University. The ITAA University is a dream of ITAA president Harris Miller. Miller’s vision would create the ITAA University from a fund created by each employer allocating one penny for every salary dollar spent (Miller, 1999). After this initial contribution by industry, the ITAA University would not require any

further corporate resources. However, Miller notes that the university would not object to various businesses assisting the ITAA in developing an IT curriculum. In fact, although Miller's ITAA University does not require anything beyond the employer contribution, Miller hopes that this idea would pave the way for a working relationship between industry and post-secondary education. Miller believes that possibilities exist for education and industry to co-design the types of courses that will be offered at the university, as well as the content taught in these classes.

The third category occupies the middle ground between the task force and the ITAA University. This category includes those academic institutions that have relationships with various IT corporations, however, they do not depend on them for as much interaction as do the institutions involved in the task force study. One institution that falls into this category is the Peter Kiewit Institute at the University of Nebraska. This institute is designed to teach students how to fulfill the requirements of business (<http://www.educause.edu/ir/library/html/erm9961.html>, 19 Feb. 2000). These requirements are gathered with the help of local businesses. These various local corporations also provide experts to teach and mentor students. Another institution that falls into this category is the Clayton College and State University. Clayton has created a new college within the university that is dedicated to reducing the IT labor shortage. In order to accomplish this goal, Clayton has to create relationships with local IT corporations. This has allowed the University to offer internships opportunities at these corporations. The university also makes use of experts from various IT companies to teach classes in this new college.

After detailing the types of programs being offered as possible solutions to the IT staffing problem, there are some similarities between the secondary and post-secondary approaches. One of these is that, with the exception of the Learn to Earn program, they each have some degree of reliance on business. Both educational levels also have programs that vary the degree of reliance that academia places on the various IT corporations. Another similarity between these programs is that they are all fairly new. This means that gathering statistics on how well these programs have performed is difficult. An even more daunting task involves measuring the impact of these programs on the IT labor shortage problem. This is difficult because the programs discussed above are very small and only implemented on a local level. These programs would need to be implemented on a much larger scale before any one of the above projects can be hailed as a solution to the problem. It is also important to note that the above research is limited and that only certain areas were examined. This study only examined the secondary and post-secondary educational levels in the United States. Before a solution to this problem can be

achieved, additional educational levels will also need to be examined.

Future researchers in this area should examine which of the above-mentioned projects produces the greatest benefit. As noted, this will only be obtainable over time. Additionally, researchers will need to examine whether there are any regional factors that effect the solution to this problem and whether one solution works best in one area of the country while another solution is favored in a different region. One area of future research involves the role that large corporations play in achieving a solution to the IT staffing problem. It is clear from the research that if the educational system requires the input of industry, as it certainly seems, then large corporations are in the position of tailoring an IT curriculum to suit their needs. The effect that this has on smaller companies, that cannot afford to allocate resources to academia in search of this solution, will also need to be addressed.

4. DISCUSSION

The question posed by this paper was, can we use the educational system to solve the IT staffing problem. This paper has attempted to answer this question by providing examples of both secondary and post-secondary educational programs aimed at increasing the IT labor force. This study has attempted to contribute to the solution of the problem by gathering similar research pertaining to solutions using secondary and post-secondary education. The examples discussed in this study attempt to improve our secondary and post-secondary educational system so that it is more responsive to the business needs of the IT community and therefore better suited to decreasing the labor shortage. However, in order to answer the question posed in this study with a roadmap for future, more research must be performed. This additional research might consist of compiling a best practices document that could be used by various academic institutions when determining which direction to proceed. Another question that must be researched is whether universities and colleges are prepared to handle an increased number of students studying in IT. There is one conclusion that can be reached without waiting for further results. This is that academia and industry must work together in order to create a solution to this problem. Some industry leaders believe that the only place IT workers are learning problem solving skills is on the job. (Skinner, 19 Feb. 2000). This comment, along with the statistics on unfilled IT jobs presented in the beginning of the paper, underscores the fact that the existing approach is not sufficient to solve the problem. We need to make modifications to the system and this takes cooperation from both sides. What remains to be determined is the best mechanism for providing that cooperation and this will only be answered over time.

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