Effects of Outsourcing and the State of Economy on Employers Hiring Practices of Engineering Graduates

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Abstract

With the current sluggish world economy, manufacturers are resorting to several tactics to maintain lean budgets. Among these tactics are outsourcing engineering and scientific jobs to nations overseas. Another, is employing only those workers who can satisfy their immediate needs. These practices have economic implications for the employers since employment decisions are determined solely by the profit/loss calculations in a time economic exigency. It also has economic implications for engineering graduates in search for jobs with salaries commensurate to their education and skills.

This paper will combine the results of a survey conducted by the authors on this subject with information from recently published studies. Literature and data gathered will be organized and tabulated to find correlations between manufacturing employers' economic outlook and their hiring practices. The results will provide insight into the availability of jobs for students majoring in engineering-related degrees.

Introduction

It is evident that there are multiple factors affecting the job prospects for individuals graduating with engineering degrees. The sluggish economy is a significant factor that influences the availability of jobs, but other forces, particularly outsourcing, are important as well. Currently, an alarming number of U.S. white-collar jobs, including engineering and scientific jobs, are moving overseas. These jobs are flowing mostly into developing economies in the Far East, Latin America and Eastern Europe where less-educated workforces, with specific manufacturing skills, accept employment at lower wages than U.S. engineering graduates.[1] In addition, multinational corporations are moving manufacturing facilities overseas to China, India, Mexico, and other developing countries. Finally, U.S. engineering graduates also face competition from engineers and scientists based overseas who can market and deliver their services via the Internet.

This article will examine hiring practices in American manufacturing firms which have been impacted by these global economic trends. Hiring practices during downturns in the economy accompanied by foreign competition is the main focus of this paper. Companies faced with difficult financial choices achieve cost cutting by hiring individuals who have the skills to perform only certain tasks assigned to them. These jobs can be short term contract positions with limited retirement and benefit packages.

Increased demand for skills, deindustrialization, and relocation of employers to other countries was limiting the job opportunities for less educated workers in the past decades. Now, with the outsourcing of scientific and engineering jobs to the developing countries, the trend started in the 1960's and early 1970's of hiring more educated employees has been reversed. Today's jobs for both educated and less educated workers are being outsourced to other countries.

On the other hand multiple problems are caused as the result of a skilled but less educated workforce. This practice hinders the growth and success of the company in the short as well as long terms. In the short-term the company is limited to taking on jobs that are simpler in nature and do not require employees capable of multitasking. In the long-run, the company will not be able to compete effectively due to the engineering staffs' lack of innovative ideas and necessary knowledge to implement those ideas. Sustained technological innovation is widely regarded as vital to the success of manufacturing companies.

According to Holzer[2], economic research indicates that employers more than ever are seeking a higher level of cognitive skills (such as reading and writing ability, and computer skills) from less-educated workers. New developments, the growing competitiveness of product markets, and the growing role of technology in many settings, has changed what employers need from their less educated workers. Among other skills, social skills--to interact with customers and coworkers--are now regularly sought. [2]

A survey of four metropolitan areas of Atlanta, Boston, Detroit, and Los Angeles indicates that 60-65 percent of jobs are in retail trade, the financial sector, or the service sector in each metropolitan area, with manufacturing accounting for just 16-25 percent.[2] These figures show a significant shift of jobs into the U. S. service industry, and out of the manufacturing sector. To some extent the theory presented here, that companies hire less educated workforce in place of college graduates, runs counter to what Holtzer argued about the effects of deindustrialization:

> "The decline in jobs in less-educated workers has been particularly striking in the area of blue-collar employment, especially in the manufacturing sector. Manufacturing jobs are giving way to jobs in the trade and service sectors. The decline in manufacturing employment has been especially severe in the Northeast and the Midwest, and its impact has been greater among black males than among any other ethnic group." [2]

Multinational companies are believed to be the main source of these changes. During the past two decades, the flexibility of the multinational companies allowed them to move their production facilities offshore, and take advantage of cheaper, less educated labor markets. At the present time these companies are moving their major R&D facilities overseas in attempts to take advantage of lower costs of hiring scientists and engineers from other countries.

Trends in Job Relocations

According to an article by Zielenziger[3], U.S. corporations are picking up the pace in shifting well paid technology jobs to India and other low-cost centers, but they are

keeping quiet for fear of a backlash. As Holzer[2] finds, generally job turnover and vacancy rates are lowest in Los Angeles compared to the other three metropolitan areas surveyed (Atlanta, Boston, and Detroit) since the majority of those jobs in Los Angeles were in manufacturing rather than in retail or the service sectors. He notes that the lower turnover likely reflects the higher relative wages paid in manufacturing.

The following table identifies several major U.S. based employers who are currently outsourcing important scientific and engineering work to offshore locations.

Company	Numbers of workers and country	Types of work
Accenture	5,000 to the Philippines by 2004	Accounting and software
General Electric	20,000 to India and China in 2003	Aircraft and Medical R&D
Intel	3,000 to India by 2006	Chip design, tech support
Microsoft	500 to India and China in 2003	Software design, IT support
Oracle	4,000 in India	Software design and support
Phillips	700 in China	Consumer electronics R&D

Table 1 – Major U.S. Exporters of Science and Engineering Jobs
Source: Business Week

Science and Innovation at Stake

Chui[4] explains data indicates that the United States is relying more than ever on the skills of foreign-born scientists and engineers. Furthermore, according to a report from the National Science Board (NSB), the number of foreign scientists coming to the U.S. has plummeted, but American engineers have not filled the gap. Chui[4] warned that if this trend continues, the nation will lose its economic and innovative competitiveness with new developing countries such as China and India. He recommends that more money be spent to train science and math teachers, to support college students, and to entice more Americans to pursue high level of scientific or engineering education.

As table 2 shows, a growing number of undergraduate and graduate degrees are awarded to foreign born engineering students mainly from the new developing countries.

Country	BA and BS Degrees		MA, MS and PHD Degrees	
	1989	1999	1989	1999
China	127,000	322,000	19,000	41,000
India	165,000	251,000	64,000	63,000
Philippines	40,000	66,000	255	937
Mexico	32,000	57,000	340	63,000
United States	196,000	220,000	61,000	77,000

Table 2 – Science and Engineering Degrees Awarded in Selected Countries
Source: National Science Foundation

Implications of Global Outsourcing of Engineering Jobs

Based on Hira's[1] testimony to the Committee on Small Business of the U.S. House of Representatives, one third of U.S. industry members (IEEE) work for firms with 500 or fewer employees. Ten percent of these employees work for Federal, State and local governments and ten percent teach at institutions of higher education or non-profit research organizations. Most of the remaining population are self-employed and work as consultants. Clearly, large U.S. firms are not employing the majority of the IEEE members.

Unemployment of American engineers rose sharply from 2.0% in 2001, to 4.2% in 2002 and then to more than 6.0% in the first quarter of 2003. IEEE-USA is concerned that these increases in unemployment may not be a short term, cyclical phenomenon. "This unemployment could be as the result of much more fundamental structural changes in the U.S. economy that could have serious, long-term affects-not only on the future viability of engineering as a high-wage/high value added career – but on the nation's economic and technological competitiveness and the continuing ability of small businesses to be a major driver of innovation and job creation in the United States."[2]

Economic, Technological and Security Implications of Outsourcing

The prime movers in the conversion of scientific innovation into products and services have been engineers and scientists at colleges, universities, and private research organizations. The core of economic and technological advantages of a country is its ability to invent and innovate.[1]

The United States' role as a world leader in technology is being threatened due to global outsourcing in the following ways:

- By the loss of many of the technological improvements in manufacturing processes that are discovered and perfected.
- Reduced opportunities for continuing domestic innovations in digital electronics, software development, and data handling applications.
- Reducing the willingness of American youth in pursuing careers in science and engineering.
- Personal economic and national security will be subjected to the increased risk for proprietary and mission critical military and national security transfer of data.

The advantages of global outsourcing are very narrowly focused. Companies undertaking these ventures see the immediate financial incentives and competitiveness gained. "The problem is that companies aren't sure it's politically correct to talk about it," said Jack Trout, a principal of Trout and Partners marketing and Strategy firm. "This causes a problem for publicly traded companies, which would ordinarily brag about cost saving to investors".[3]

Other than the financial incentives for larger corporations, one of the good things about global outsourcing is that "we've got some of the brightest people doing research for us."[4]

Suggestions to Reduce the Pace of Outsourcing

Although a vast majority of companies use economic gain as the main reason for their outsourcing policies, the implementation of the following suggestions would reduce the current pace of outsourcing:

- State legislators should enact laws to give various tax credits to companies that choose to remain in the United States.
- Companies should emulate different innovative methods adopted by other companies to reduce costs and maintain jobs in the USA. Beneficial methods include: offering graduates appropriate lower salaries, providing flexible scheduling, increasing productivity, and reducing inventory.
- States should reform the unemployment insurance systems to reduce the cost on businesses caused by wage-base fees. Elimination of mandatory surcharges on businesses is also a viable alternative.
- The United States government should ratify regulations that prevent different branches of the government from establishing contracts with businesses that relocate to other countries.

Survey Development and Results

In order to investigate the literature review, which indicated that in a downturn economy companies are more inclined to hire less educated workers with specific skills to cut costs, a survey instrument was developed. The survey was sent to 20 employers and 50 students, mainly in the Greater Cincinnati area. Twenty students majoring in various engineering related subjects and eight employers responded to the questionnaire.

The results from students' responses are shown in table 3. The data indicates that 95% of the respondents were employed and majority had jobs related to their major of study. Only forty percent of the respondents indicated that their employers were supporting their education. A majority of the students perceived that pursuing more education would not increase their salaries.

	Yes (%)	No (%)
Are you currently employed	95	5
Is your job related to your major	52	48
Does your employer financially support your education	40	60
Do you perceive your salary will increase if you attain a higher level of education, while working for the current employer?	39	61

Table 3. Survey results from: Engineering Students

	Not Important (%)	Somewhat Important (%)	Fairly Important (%)	Very Important (%)
When hiring engineering staff, how important is their educational level?	5	23	24	48
Considering that lower salaries are paid to individuals without a collage degree, how important is the education level of your engineering staff compared to the level of skills that they posses?	11	33	22	34
At the time of economic slow-down, how important is it hiring an individual with an engineering degree compare to someone skillful enough who can do the job at a lower cost?	13	31	29	27
How important is funding educational development of your engineering staff.	7	26	29	38

Table 4. Survey results from: Industry (Employers)

The results from the employer responses are tabulated in table 4. The results indicate that while majority of the employers consider the education level of their employees as fairly or very important, they are less inclined to pay higher salaries to their better educated staff in a downturn economy.

Interestingly, while the majority of employers (67%) consider funding educational development of their engineering staff as fairly or very important, only forty percent of the students perceived that their employers will support their educational development. The finding suggests that although a large number of companies consider funding educational development of their employees, in contrast a small number of employees take advantage of these benefits. It can be argued that the contrast in the data is due to a number of reasons such as the initial payment of tuition by employees, stringent conditions placed on full refund of tuition to the employees, scheduling problems, and employee workload, etc.

Conclusion

Current economic and unemployment problems, as well as broad structural changes in the economy, are complex and interrelated. There are no easy answers in terms of public policy recommendations. It is clear that the movement of manufacturing facilities and blue-collar jobs is continuing, as is the movement of essential R&D facilities and service functions overseas. The loss of these U.S. white collar jobs to lower cost, offshore locations is a major contributing factor to our current unemployment crisis.

In this paper we studied the effects of outsourcing and the state of economy on the hiring practices of employers. We also developed and administered a survey instrument and reported the results in the paper. Due to time constraint, the survey was limited to the Greater Cincinnati area and might not reflect the national trend. We intend to have a

comprehensive follow-up survey that will include a random sample of students, employers, and graduates of engineering programs form around the country.

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