Keeping Up With a Global IT Workforce

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Abstract

Economic issues have recently leapt into the realm of computing and information technology (IT) professions. As with a number of industries that have moved from isolation to globalization, the IT industry has undergone drastic, but not unexpected, changes as a worldwide economy has emerged. The information industry evolved in a very short time due to the rapid development and improvement of computer hardware and software and the increased need and capacity for information sharing. As the industry has matured, it moved along a similar path to that of agriculture and manufacturing. Because of increased communication and travel capabilities, the workforce that is able to participate in the information industry is no longer limited to the United States and other developed countries. As the needs of this industry continue to evolve, so must its workforce education and preparation. With an already crowded curriculum, computing and information systems educators are challenged to develop and monitor a rigorous and relevant plan of study. Thus, IT industries and universities who prepare the workforce must continually adapt creative and meaningful strategies in order to prepare competitive workers while balancing an expanding curriculum.

Introduction

Computing and information systems professionals in the United States are reeling from the impact of a shifting information technology (IT) industry. Jobs are being outsourced, offshored and given to the lowest bidder. What was once an industry that could be dominated by workers in the United States is now open for competition from a worldwide supply of workers.

Throughout U.S. history, as industries matured, they faced challenges to offer products and services at lower prices. The industries “suffered” a movement of goods and services production to other locations. The movement was devastating for entire communities, such as when General Motors moved its automobile production away from Flint, Michigan. But that same movement was generally seen as positive for workers in Mexico who took on those jobs. Automobile production cost was lower in Mexico where employees would work for less and where unions were not organized to challenge management. The IT industry has likewise realized a movement of jobs, mostly entry-level jobs, to other countries because of offshoring and outsourcing of information technology. Thomas L. Friedman points to the shift of IT jobs as a result of globalization (Friedman, 2005). Faster transportation and faster communication have shortened the distance between the U.S. and the rest of the world. Friedman points out that globalization is not a new phenomenon for the U.S., or for the world. When

transportation opened up the world for commerce and communication in the early 1800s, industries were challenged to take advantage of a worldwide market. The U.S. has realized major shifts in jobs as the focus of employment has moved from agriculture, to manufacturing, and now to information.

In the past two hundred years we have seen the globalization of many industries, including textile, automotive, steel, and electronics. Each of these industries has gone through similar experiences with globalization. While these industries are inherently different from the information industry, their history may shed light on how to better prepare an information industry workforce to remain competitive in a global society.

Movement of Jobs

Industries in the U.S. certainly benefited from technology that came from, but did not "belong to", other countries. Experience with British cotton mills contributed to the U.S. textile industry, technology from German engine and automobile designers contributed to the U.S. automobile industry, processes from German iron and steel processing served as a basis for the U.S. steel industry, and knowledge of magnetism and electricity from Italy, Scotland, Denmark and England set the groundwork for the electronics industry. Without some degree of worldwide knowledge sharing, none of these industries would have progressed at the rate they did.

For each of these industries, the availability of machines and improved processes opened up the possibilities of new jobs. As machines evolved, production increased, processes improved, and new skills were required of workers. New jobs evolved in the form of training, management, marketing and sales. As businesses matured and production increased, so did the demand for more employees. More employees brought on worker concerns of working conditions, minimum wages and working hours.

For example, the textile industry thrived in the northeastern U.S. from about 1790 until the 1880s. Because of lower wages, labor strikes and poor working conditions, textile production started moving from the northern U.S. mills to the southern U.S. This was an early peek at what would become offshoring. Since the Second World War there has been a decrease in locally-produced textiles and an increase in the textiles imported to the U.S. from Asia, Central America and South America. The Department of Labor reports a large drop in the number of employees in textile plants in Massachusetts since 1947. And in North Carolina, the largest textile state in the U.S., there has been a continuing decline in the number of textile plants and in the number of textile employees from 1990 to 2003 (Tomorrow's Jobs). The Department of Labor reports a shift from "goods-producing" to "service-providing" employment (Brauer, 2004, and McDougall, 2005). The changes didn't happen quickly, but over a period of several years.

A Shift in the Information Industry

The information industry seems to have followed a similar pattern to that of earlier industries. In a machine-development phase, computers were built. Because many

of the early companies built their own machines, wrote their own software, and developed specialized products, many companies such as IBM and XEROX could exist in isolation. Soon the demand for computers increased and computers were mass-produced and priced affordably, leading to a need for more computers with ever-increasing capabilities and people with skills to meet the information needs of the community. Computing capabilities improved and technological advances were made. Ultimately, computers were so affordable that they were in demand throughout the world.

From Isolation to Globalization

Most industries seem to have gone through several distinct growth phases in the U.S. as shown in Table 1. The first phase involves **mechanization and isolation**. In this phase machines such as sewing machines, automobiles, and computers are built for a specific and immediate purpose. Basic costs for the industry are labor, materials, tools, and maintenance of tools. Initially an industry might operate in isolation in that raw materials are gathered, a product is made, and the product is sold within a small community. As an example, early people made fabric or tanned animal hides, cut and sewed it to make garments for their family or community. Quality of workmanship and design was important because the product was used within the family or by a known community member.

Growth Phase	**Attributes**	**Costs**
Phase 1: Mechanization	Producer likely to know local consumer	Labor, materials, tools, maintenance of building tools
Phase 2: Low-cost production	Drop in transportation and communication costs, availability of lower-cost workers, on-the-job training	Lower-cost labor, shipping, distributed management, development of new marketplaces
Phase 3: Distributed production and consumption	Globalization, loss of connection with consumer, wages increased in the previous location so production moves again	Even more shipping opportunities and long-distance communication, even more distributed management, coordination of efforts, regulations, standards, trade agreements, addressing political and cultural differences

Table 1. Typical growth phases in an industry

A second phase involves a move toward **low-cost production**. In the 1800s U.S. workers in rural areas were willing to work for entry-level wages, and the cost of transporting raw materials and products dropped. This occurred as a result of an earlier globalization caused by improved transportation via trains, cars, and ships, and the ability

to communicate globally more quickly via such advances as the transatlantic cable (Gordon, 2003). This created a need for management over a more geographically spread domain, and created a need for product marketing. Thus, new jobs were created. In this phase the information industry realized an increase in information exchange because of improved and cheaper data transmission with Ethernet and fiber optic technologies. There were so few trained information workers in the early phase of the information industry that it was common to hire professionals with liberal arts degrees who could be trained as computer programmers.

In a third phase, the industries got larger and more **distributed**. No longer did one person control or understand an entire industry. This phase could be considered true globalization in that products are created or developed in the most **cost-effective** way possible: to have raw materials gathered where they grow, to ship the raw materials by the most cost-effective transportation to a location where it can be manipulated by low-cost labor, to have it marketed by experts, and to sell it where there is a market for it. For the information industry, the most cost-effective way to distribute workload is to have the hardware made where it is cheapest, testing and quality control done where the expertise is, software developed at several locations, and communications done through the Internet and cell phones. Following this cost-effective business approach, Thomas Palley (Palley, 2006) reports that a shift occurred when the U.S. began to see other countries exporting goods back to the U.S. He expresses the need to develop new rules about international competition and to understand changing business models that have arisen because of globalization.

Changing Players

In a recent New York Times interview Nandan M. Nilekani, the chief executive of India's Infosys Technologies, indicated that India and China, while missing out on the industrial revolution, are now posed to compete in the information market. He stated, "…you can't stop these things, they're all megatrends. They're going to happen whether you like it or not. In fact, the guys who are going to win are the ones who say, 'It's going to happen anyway; let's figure out how we can take advantage of it (Jelveh, 2005).'"

A special report in Business Week in December 2004 predicted that China was on track to have the largest economy in the world in 10 years. Mandel (Mandel, 2004) makes two very important points in this article: 1) the global community can benefit with the rise of a new economic power similar to the healthy economy of Western Europe that was helped by the global trade and technology advances that were being shared by the U.S. from 1820 – 1913, and 2) the "benefits of trade are vulnerable to political and financial turmoil."

Like the U.S., Hong Kong was once a major manufacturing site. As a result of cheaper labor from China, Hong Kong's role changed to that of manager and marketer for goods produced in China. As new ports are opening for trade, China can keep more of its profits and pay less to middlemen by trading directly with the rest of the world. Since the 1960's, according to Donald Tsang (Tsang, 2005), chief executive of the Hong Kong

Industries, Hong Kong has moved from manufacturing to a "knowledge-based business hub."

Affect on U.S. IT Job Market

According to Fulbright and Routh (Fulbright and Routh, 2005) some of the information technology jobs that are likely to be safe from outsourcing and offshoring are the ones considered to be traditional IT jobs involving analysis, research and development. However, other IT-related jobs involving management, marketing, sales, finance, and outsource/offshore management are also in demand. Most of these are jobs that have evolved in Phase 3 as the need for coordination due to a distributed industry has risen.

A Competitive Curriculum

U.S. students may have an incomplete skill set without a sense of history, without an appreciation for other cultures and work environments, and without management experience. In order to compete, students will need to develop political, financial, social, and cultural savvy. While the Texas core curriculum for higher education includes courses that address political, social and cultural histories, students in IT fields also need exposure to topics of negotiation, economics, current affairs, and distributed project management. However, the need for critical-thinking skills developed in science, mathematics and engineering courses continues to be necessary and cannot be minimized. Written and oral communication skills are perhaps more necessary than ever before. The need for creativity developed in arts and music programs continue to be important. An understanding of psychology and sociology is basic to a global economy. All of this, and more, must fit into an already crowded undergraduate curriculum that should not exceed 120 semester hours.

Conclusion

Existing courses and programs will need to be updated to keep students current. The challenge to educators will be to work together with a sense of urgency to develop a rigorous and relevant curriculum to prepare a workforce that can remain competitive with the rest of the world.

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