IMMIGRATION GLOBAL IT WO

Competing for IT talent in a global labor market.

■ IN 1998, FOR THE SECOND CONSECUTIVE YEAR, the U.S. quota of 65,000 H-1B visas for temporary (1–6 years) employment of foreign workers with technical skills was exhausted before the end of the fiscal year. Leaders from many technology industries conducted a vigorous lobbying campaign in 1998 that resulted in legislation raising the quota to 115,000 for fiscal years 1999 and 2000, but in 2000 even the expanded quota was used up six months into the year. Legislation was subsequently passed in 2000 to expand the quota to 195,000 for the following three years.

Lawrence A. West and Walter A. Bogumil

The demand for IT professionals in the U.S. is occurring at the same time that other developed countries are experiencing similar shortages and when developing countries need their IT workers to support infrastructure creation, new industrial efforts, and government programs. Meanwhile, the ability of the U.S. to attract foreign workers reflects an unprecedented mobility in the worldwide IT labor force giving rise to "labor liquidity" in which individual workers can seek out demand and demand can seek out available workers. The result of this situation is a worldwide market for IT professionals in which government policies reinforce or hinder the competitiveness of a country's firms and economy. Countries are competing with each other for a scarce and valuable resource in much the same way they have previously competed for gold, timber, or oil. Instead of competing with armies and navies, though, nations in this modern contest for economic prosperity are competing with visa quotas, working conditions, salaries and benefits, and opportunities to work with cutting-edge technologies and business environments.

The IT Labor Shortage

Most bewildering is the government's reluctance to give strong preference to applicants with advanced training, despite the benefits they bring to the economy and the great demand for skilled workers.

GARY BECKER [2]
1992 Nobel Laureate in Economics

By early 1998 the shortage of qualified IT workers in the U.S. had become a matter of considerable concern. The Department of Commerce's Bureau of Labor Statistics (BLS) reported that computer scientists, computer engineers, and systems analysts would be three of the fastest-growing occupations through the year 2006. Projections of demand for computer programmers are also high, though not as high as for the preceding classifications. The Office of Technology Policy analyzed the BLS data and reached the conclusion that there would be nearly 138,000 new jobs per year in these core IT occupational clusters through 2006 [11]. In a separate 1998 study, the Information Technology Association of America (ITAA) found that nearly 10% of all U.S.

AND THE
RK FORCE

IT positions were unfilled in that year [5]. The total of 346,000 vacancies occurred at roughly similar rates throughout the country, regardless of organization size, and across various organizational types.

Further, remedial actions are not keeping up with demand. While enrollment in bachelor-level programs in computer science is increasing, total graduations in computer science and management information systems at the bachelor's and master's levels remain at less than half of the new annual demand and don't begin to address the backlog [12].

A number of organizations, including the American Engineering Association and the U.S. Office of Management and Budget, have criticized the methodologies of these studies [3, 7]. In response, the National Science Foundation funded a study by the Computing Research Association that found: "...the data are inadequate to ascertain what mismatch there is, if any, between national supply and demand" but "the preponderance of evidence suggests that there is a shortage of IT workers, or at least a tight labor market" [3, p. 10].

The tight IT labor market is not unique to the U.S. A recent Microsoft study found that Western Europe has a current shortage of 850,000 IT sector jobs[1] with the shortage expected to grow to 1.7 million by 2003 [9]. Germany alone is reported to have a shortage of between 75,000 and 80,000 IT professionals[2] and other European Union (EU) countries report shortages of varying severity. Canadian researchers report that a 1998 shortage of 20,000 IT professionals will grow to nearly half a million by 2010 [1], spurred in part by internal demand and partly by an exodus of IT talent to higher pay in the U.S. Meanwhile, parts of Latin America face a shortage of IT professionals driven by infrastructure development needs, new e-commerce projects, improved banking services, new demands by multinational firms, and an outflow of IT talent, often to the U.S. India, long a supplier of knowledge workers to the rest of the world, is now facing its own IT work force crunch as new e-commerce opportunities and a thriving offshore software development industry create increased domestic demand for IT professionals.

Economic Implications of an IT Work Force Shortage

The annual labour of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it annually consumes...

ADAM SMITH
The Wealth of Nations

The size of any shortage tells only part of the story. From 1990 to 1998 the growth in the IT sector of

LISA HANEY

---

[1]The IT sector was much more broadly defined in this study and includes computer-literate clerical workers.

[2]The German figures are for IT-specific professions such as programmers, analysts, computer scientists, and so forth.

the U.S. economy has been modest at 2% but statistics show that the effect of IT as a driver of economic growth has more than doubled over the same period [10]. Further, overall economic growth has been impressive with gross domestic product (GDP) increasing by 48% over this period (6% per year). Additionally, overall investment in IT equipment (including telephone equipment) grew from 3% annually in the 1960s to 45% by 1996. Falling prices in the IT sector have also been credited with reducing the U.S. annual inflation rate in the mid-1990s by one percent. Finally, growth in IT industries and IT positions in other industries has created a number of high-paying jobs with average wages for IT positions at $46,000 per year compared to $28,000 for the 1996 private-sector economy.

> *Salary is one of the most obvious elements of competitiveness in any labor market and is key in the present instance as well, especially when comparing developed and developing countries.*

The economic impact of IT internationally varies greatly. One report indicates the industrialized countries of Western Europe have lost $105.74 billion in GDP since 1998 due to a shortage in technology workers, with similar losses expected annually in the near term [9]. Taiwan's approximately $30 billion/year computer industry has had difficulty filling technical positions for several years and Singapore's continued development has been significantly constrained by difficulty filling an estimated 11% per year growth in IT staffing requirements. In India, a centuries-old history of scholarship and a rich system of educational institutions has given rise to a burgeoning software industry, much of it devoted to satisfying the needs of Europe and the U.S. Recent growth in this important sector is now being constrained by a shortage of IT professionals, created in part by an exodus of some of the nation's best programmers to the U.S., Europe, and elsewhere. As more countries begin to compete in this industry the missing technicians may be the difference between maintaining a current level of competitiveness and pushing forward ahead of the competition.

Less-developed countries face different consequences of a shortage. Some countries have nurtured educational, social, and economic infrastructures for decades and are poised to see their economies fully participate in the world economy, just as the requirements for participation have changed. Shortages of IT workers in some Latin American countries, for example, are constraining the countries' ability to upgrade their banking infrastructures at a time when electronic banking, e-commerce, and participation in a global financial network are keys to financial effectiveness. In the least-developed countries, a shortage of IT talent means that foreign contractors must bring their own technologists with them. These countries also suffer from a lack of workers in the government sector during a time when infrastructure management is critical. Those workers who don't leave the country completely are much more likely to choose positions with multinational or other private-sector firms.

Every Man's Interest

The whole of the advantages and disadvantages of the different employments of labour and stock must, in the same neighbourhood, be either perfectly equal or continually tending to equality. …Every man's interest would prompt him to seek the advantageous, and to shun the disadvantageous employment.

Adam Smith
The Wealth of Nations

In the modern labor market IT-literate workers have an unprecedented ability to learn of opportunities in distant markets and to pursue them. As a result, the average IT worker's "neighborhood" is global in scope resulting in an international competition for scarce IT professionals. The diverse and interlocking elements that define "advantageous employment" for domestic and immigrant workers alike, and how these elements become instruments in the competition for IT labor, are explored here.

Salary is one of the most obvious elements of competitiveness in any labor market and is key in the present instance as well, especially when comparing developed and developing countries. Whereas a new college graduate in MIS or computer science might expect a starting salary between $35,000 and $50,000 in certain U.S. labor markets, their counterparts in many developing countries will be lucky to see a quarter of that amount. Even adjusting for differences in cost of living, it is often easier for single (usually male) immigrant IT professionals to live comfortably, save money, and support a family in the U.S. than in their home countries.

Opportunity for professional growth is another

element of the competition between nations for IT labor. Many IT workers understand that their resume is their most important asset and seek out positions where they can work with modern or leading-edge technologies. While many countries offer opportunities to work in emerging areas, the U.S. is the undisputed leader in the sheer number and variety of IT jobs working with resume-enhancing technologies. This situation is fueled by a number of factors, some of which are themselves elements of the competition for IT labor.

Consider, for example, the confluence in the U.S. of 270 million people, a computer-literate work force, a computer-literate public, an effective telecommunications infrastructure, venture capital,

> *As long as IT professionals remain mobile and world demand and market circumstances give some nations advantages in recruiting IT professionals, the disadvantaged nations will come up short.*

research universities, companies and governments with established IT infrastructures, median household income at approximately 40 times the cost of a personal computer, and a government willing to support immigration programs for critical skills. These factors embody the essence of Porter's diamond model for an innovation-driven economy [8] and create the demand for new IT technology while at the same time fueling the supply. The question that faces policymakers in other countries is where their nation has room to improve their competitiveness by attracting or retaining skilled IT talent.

Australia, for example, has a literate and affluent population, but lacks the market size and concentration of investment capital to compete with the U.S. in providing IT employment opportunities. As a result, there are some 5,000 Australians working in Silicon Valley despite a shortage of over 30,000 IT professionals at home. Some Latin American and European countries suffer because of their limited telecommunications infrastructures. While countries like Chile have modern systems with competitive telecommunications pricing and Internet access, others have government-run telephone companies with service levels that don't support modern e-com-

merce development. In some countries dedicated Internet connections are not available and all telephone calls, including Internet connectivity, are priced by the duration of the connection. A complaint in some African countries is that the phone system is so unreliable no e-commerce or interorganizational system development is feasible.

Quality of life is another element of the competition between nations for IT talent. Those countries with large existing immigrant populations provide a natural social support system for new arrivals and thus are more competitive than more xenophobic nations. Conversely, many countries have been the beneficiaries of talented professionals leaving troubled areas such as Colombia, the Balkans, the Middle East, and South Africa in large numbers.

A different competitive arena involves the welcoming mechanisms for prospective workers. Consider, for example, three aspects of U.S. policy that affect this area. First, the U.S. has raised the volume of temporary professional work visas twice in as many years as demand has increased. In contrast, the original German proposal to create 20,000 five-year technology positions for foreign workers faced serious public and political opposition [6]. Second, U.S. law also allows professional workers on H-1B visas to apply for permanent residence while in the U.S. In contrast, Germany's new program forbids permanent immigration and Germany has publicly announced it is not a "country of immigration." Other countries have varying support for permanent immigration by their guest workers. Great Britain has a relatively high proportion of immigrant citizens compared to other European countries and Canada's laws are also liberal in supporting permanent immigration [4]. Finally, U.S. law explicitly provides for families of foreign technology workers to accompany their sponsor under several visa and immigration programs. In contrast, the German program was originally designed to specifically prohibit entry of family members.

The U.S. and Germany aren't the only countries with programs to attract foreign technology workers. Canada, Japan, and even India have all taken recent steps to facilitate the entry of foreign professional workers, especially IT specialists. Australia and New Zealand recruit foreign professionals, including those from the U.S., by promoting the natural beauty of their countries and the relaxed lifestyles. Australia is also considering easing the immigration process for IT specialists and has already relaxed its rules for foreign students who wish to remain to work. Other countries are taking steps to address the outflow of companies and talented individuals.

Britain has recognized that a recent tax change is penalizing independent contractors and is considering revising the law. Ireland, a modern success story in the cultivation and support of a technology-based economy, has developed a program that gives Irish passports to first- and second-generation descendents of Irish emigrants who wish to return home.

Conclusion

Prosperity depends on creating a business environment, along with supporting institutions, that enable the nation to productively use and upgrade its inputs.

MICHAEL E. PORTER [8]

The Competitive Advantage of Nations

With worldwide competition for IT professionals and unprecedented mobility in the IT work force it seems that the best method for attracting or retaining IT workers involves the development of an overall program of economic, social, and technical opportunity. India and China, for example, seem to be experiencing a reverse brain drain as experienced IT professionals return home to take leadership roles in new ventures. Increased domestic demand, fueled by a combination of new domestic software needs, increased Internet connectivity, new e-commerce ventures, and local software shops developing for foreign customers, are all attracting experienced managers and entrepreneurs back home and providing rewarding employment for local entry-level technologists. Costa Rica has parlayed political stability, a growing educational infrastructure, and an aggressive program to recruit foreign firms such as Intel into an unemployment rate less than 5% and wage and job opportunities that tend to keep talented citizens at home. Trinidad and Tobago has created a foreign investment zone aimed at high-tech industries and has eliminated import duties on computer equipment in an attempt to both increase foreign investment and to encourage a generation of domestic computer users.

Unfortunately, these and similar programs do not affect the overall supply of IT workers. As long as IT professionals remain mobile and world demand and market circumstances give some nations advantages in recruiting IT professionals, the disadvantaged nations will come up short. When the consequence is a spiraling deterioration in the ability of these countries to develop modern economies then the result will be a pervasive gap in the wealth-creating potential between nations of the world.

Do countries have options? Yes. But any program to address local work force shortages must address a multitude of the factors that constitute the advantages and disadvantages of employment in any particular place. In the final analysis, each country has the natural advantage stemming from the reluctance of most people to leave home, family, and the comfort of familiar surroundings. We have seen, though, that disparity in opportunities has served to overcome this tendency toward inertia for informed IT professionals. Countries wishing to retain these skills at home will need, first of all, to address these disparities. **C**

REFERENCES
1. A crisis that won't go away. *Computing Canada 25*, 8 (Feb. 26, 1999), 8.
2. Becker, G. Give me your yearning high-skilled professionals. *BusinessWeek* (Apr. 24, 2000), 30.
3. Freeman, P. and Aspray, W. *The Supply of Information Technology Workers in the U.S.* Computing Research Association, Washington, DC, 1999.
4. Have we lost our minds? *Education Review 1*, 2 (July/August 1999); www.caut.ca/English/Publications/Review/9907_lostminds/page1.htm.
5. *Help Wanted: A Call for Collaborative Action for the New Millennium.* nformation Technology Association of America (ITAA) and Virginia Polytechnic Institute and State University, Arlington, VA, January 12, 1998.
6. Martin, P. Germany: Green Cards? City of Frankfurt Main Office of Multicultural Affairs; www.stadt-frankfurt.de/ amka/english/informations/usuk_informations_text.htm, 2000.
7. Matloff, N. Critique of the Department of Commerce report entitled "America's New Deficit, The Shortage of Information Technology Workers." American Engineering Association, Inc.; www.aea.org/news/doc_critique.htm.
8. Porter, M. *The Competitive Advantage of Nations.* The Free Press, NY, 1998.
9. Rhoads, C. Germany faces storm over tech staffing—Labor groups are enraged by proposal to import badly needed workers. *Wall Street Journal* (Mar. 7, 2000), A23.
10. U.S. Department of Commerce, Secretariat on Electronic Commerce. *The Emerging Digital Economy.* U.S. Department of Commerce, Washington, D.C., April 1998.
11. U.S. Department of Commerce, Office of Technology Policy. *America's New Deficit.* U.S. Department of Commerce, Washington, D.C., January 1998.
12. U.S. Department of Education. *Digest of Educational Statistics 1997.* U.S. Department of Education, Washington, D.C., 1997.

LAWRENCE A. WEST (lwest@bus.ucf.edu) is an assistant professor of MIS at the University of Central Florida in Orlando, FL.

WALTER A. BOGUMIL (wbogumil@bus.ucf.edu) is an associate professor of Management at the University of Central Florida in Orlando, FL.