



EXECUTIVE SUMMARY

Knowledge — the production and dissemination of context-dependent information — is playing an important role in wealth generation around the world. In this economy, ideas and know-how are proving to be as valuable as the traditional factors of production: capital, land, and labor. China and India are already riding this new economic wave.

12 TRENDS changing the world

A five-year research project reveals that the future of commerce worldwide will be greatly influenced by a dozen “global tectonics” that will affect business leaders across all industries:

1. Biotechnology
2. Nanotechnology
3. Information technology
4. Population
5. Urbanization
6. Disease and globalization
7. Resource management
8. Environmental degradation
- 9. Knowledge dissemination**
10. Economic integration
11. Conflict
12. Governance

Knowledge Dissemination: Economic Development Solution

BY FARIBORZ GHADAR

During the technology boom of the late 1990s, dot-coms and telecommunications companies were flooded with millions of dollars in investment that they used to wire the world, laying fiber-optic cable all across the ocean floors. This not only tied the globe together, but the excess supply of connectivity meant that the costs of phone calls, Internet connections, and data transmissions declined dramatically. Coupled with declining prices of computers and the availability of new technology across the globe, this dispersion of technology created a world in which gathering and sharing information become as simple as typing your topic into a search engine to gather the knowledge you desire.

One such search engine, Google, now processes between 2 billion and 3.5 billion searches per day (up from 150 million four years ago), with only 91 million of these being U.S.-based searches. What began as a technology company has now evolved into a software, technology, Internet, advertising, and media company.

Knowledge — the production and dissemination of context-dependent information — is playing an increasingly important role in the generation of wealth around the world. In this third-wave economy, ideas and know-how are proving to be as valuable as the traditional factors of production: capital, land, and labor. In developed countries, knowledge-based industries such as telecommunications and software continue to grow, forcing older industries such as steel and automotive to shift production overseas to take advantage of cheaper materials and labor. By 2015, it is projected that only 4 percent to 8 percent of all jobs in the United States will be in direct manufacturing. The knowledge economy will place demands on businesses to seek new windows of opportunity — opportunity to maintain an educated work force and to invest more heavily in research and development.

Many countries are successfully addressing the challenges and opportunities that globalization creates by emphasizing the importance of education and investment in technological research. As their political systems grow more liberal and technology continues to allow them to connect to the rest of the world, countries in Asia and Europe are thriving as never before in the flattened world of globalization.

China: Putting globalization to work

China is one nation taking advantage of the benefits of globalization, capitalizing on its vast source of knowledge workers and investing in improving education, especially in math and science. The city of Dalian, located about an hour by plane north-east of Beijing, exemplifies how rapidly China's cities are attracting businesses as knowledge centers rather than manufacturing hubs. Leading companies including GE, Microsoft, Dell, SAP, Sony, and Accenture have begun doing business there, setting up backroom support and new software research and development centers.

The speed and ease at which information can be shared and accessed has led to the simplification, collaboration, and improvements that make our lives easier and safer. In the past decade alone we have witnessed significant technological developments and have created a world in which knowledge and information can be shared seamlessly across the globe.

Currently, Wal-Mart is setting the gold standard in sharing information and collaborating with suppliers and customers. Most recently, Wal-Mart embraced electronic product code technology, forcing its top 100 suppliers to begin using radio frequency identification tags on all cases and products that are channeled through any Wal-Mart or Sam's Club. By implementing RFID technology in its

stores, Wal-Mart believes it can more efficiently ensure product availability on its shelves, improving the shopping experience for its customers and enabling it to track its inventory more efficiently. As a result, consumers will be able to find more easily the products they desire, while Wal-Mart's supply chain will benefit through increased availability of information concerning inventory management.

The massive effort that connected the world via the Internet coupled with the increased availability and accuracy of information online has led to significant developments in the way global society functions. Competition for knowledge workers will increase as location becomes less important and personal knowledge and ability become paramount. Governments will be forced to address the need for education, especially in the fields of science and mathematics. Companies will need to adapt, share information among clients and suppliers, and take advantage of labor wherever it is most qualified and profitable. Furthermore, countries and companies will need to develop ways to manage and protect their knowledge- and technology-based economies.

Microsoft founder Bill Gates recognizes the trends in knowledge dissemination and illustrates how geography no longer trumps talent in the world of globalization. "Thirty years ago if you had a choice between being born a genius on the outskirts of Bombay or Shanghai or being born an average person in Poughkeepsie [N.Y.], you would take Poughkeepsie because your chances of thriving and living a decent life there, even with average talent, were much greater," he said. Today, Gates would choose to be a genius in China over an average person in rural New York. As more people in the world are given the tools to communicate and access information quickly and easily, a talented and educated work force is paramount to the

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success of companies and countries.

World leaders have responded to the rise of the knowledge economy by emphasizing educational development to attract or maintain business investment. A December 2002 World Bank report warns that developing countries will need to close the knowledge gap even though many of these states lack the educational systems and technological infrastructure to be competitive in a knowledge-based economy.

Contrast Mexico with China, for example. In the 1990s, global exports from Mexico and China grew in many of the same areas, including auto parts, electronics, toys, and sporting goods. However, China's exports grew faster. Mexico fell behind not simply because of what China was doing right but because of what Mexico was doing wrong. China's advantages in education, privatization, infrastructure, quality control, mid-level management, and the introduction of new technology helped the country find success and grow, while Mexico fell behind.

The Chinese government continues to place heavy emphasis on research and development, creating greater public awareness for innovation and reforming financial and tax systems to promote growth in cutting-edge industries. President Hu Jintao in January 2006 called for China to make the transition from a manufacturing-based economy to an innovation-based one, and this year's National People's Congress has approved large increases in research funding. What are controversial areas of investigation in some countries, such as stem-cell research and gene therapy, face minimal regulation in China. China also is actively developing its software, semiconductor and energy industries, including renewable energies such as hydro, wind, and solar power.

Realizing that science and technology are at the forefront of the modern

economy, China implemented efforts to educate young people in these fields to promote growth and economic development for the nation. Through their science and technology policy implemented in 1995, Chinese leaders established a number of basic principles and goals. Among these principles is the mission: "Respect knowledge, respect talent, and create an environment favorable for people's exhaustive playing of their roles and cultivating and bringing up new talent." This notion sums up the importance of knowledge in the world of globalization, and it explains the mindset that has allowed China to rise to the top as a major player in the knowledge industry.

In following this strategy, China has taken steps to realize its nation's knowledge potential by investing heavily in education. In 2004 the central treasury of China appropriated more than 10 billion yuan (roughly \$1.2 billion) for compulsory education in rural areas, up an incredible 70 percent from the previous year. As a result of the increased funding for education, more than 2 million illiterate people received education, more than 2,000 boarding schools in western rural areas are currently being built, more than 8,000 ramshackle secondary and elementary schools are being renovated, and about 24 million students from impoverished areas have received free textbooks. Now these Chinese students, even if they are poor, have a responsive government that is giving them the tools to compete in the globally integrated world. You can see why Bill Gates says he would now rather be a genius in China than an average student in Poughkeepsie.

China's success has been evident in recent years. A talented knowledge pool and cheaper labor force have encouraged a number of companies to invest in projects in China and set up companies there. By 2001, 400 of the

Forbes 500 companies had invested in more than 2,000 projects in Mainland China. Gates admits that within a few years of its inception in 1998, Microsoft Research Asia had become the "most productive research arm in the Microsoft system in terms of the quality of ideas that they are turning out." The Chinese government is so committed to improving its education in science and technology that it gave Microsoft the right to grant postdoctoral degrees.

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India: Knowledge management leadership

India is another country emerging as a world leader in knowledge management due to globalization's impact on the speed and ease with which people can share information. Like China, India's government regards education in science and technology as a top priority, and because of this, India's rapidly growing software sector is boosting service exports and modernizing the economy.

In March 2000, the Kamataka government announced the state's new



millennium information technology policy to bring the benefits of IT to everyone. According to Kamataka IT Secretary Vivek Kulkarni, "We already know that there is going to be a big shortage in the IT sector. And this shortage can come in various categories."

At the high end are professionals who will do very sophisticated systems work, and at the entry level there will be a need for teams of data entry operators of medical transcription and call centers. "So what we are planning to do is ensure that the people will be able to join the work force quickly," Kulkarni said.

The Haryana government is currently inviting bids from consulting firms to develop a \$23 million education city near New Delhi modeled after Oxford and Cambridge universities. The goal of constructing the city is to reverse the trend of India's smart-

est young students traveling abroad to study in search of a better education. The university will be given the latest in high technology, and it aims to recruit a first-class faculty.

India's commitment to educating its people in science and technology has roots back to 1951 when Jawaharal Nehru, India's first prime minister, set up the first of seven Indian Institutes of Technology. Since then hundreds of thousands of Indians have competed to attend and graduate from these prestigious schools.

Already the world has seen the incredible results this emphasis on science and technology has had on the Indian economy. Revenues from the IT industry in India reached \$16.2 billion in 2004-05, and software exports rose to \$17.2 billion in 2004-05, with similar growth rates expected in fiscal year 2005-06.

It's safe to say that without Indian

immigrants, Silicon Valley wouldn't be what it is today. Indian engineers have been coming to the United States in increasing numbers since the early 1970s; almost half the H-1B visas given by the U.S. State Department go to Indian engineers. (H-1Bs are granted to foreigners who have specialized skills or are, oddly enough, fashion models.) High-tech companies need people desperately, and U.S. engineering schools simply don't produce enough graduates to fill the specialized jobs the high-tech industry creates. In addition, many corporations claim that the engineers U.S. schools produce typically aren't as talented as those from India. (Bear in mind that Indian immigrants have graduated from schools that make Harvard and the Massachusetts Institute of Technology seem easy to get into by comparison.)

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billion in India, the rigorous competition to gain entry into these schools has provided the country with a rich source of people educated in science and technology. In 1999, when the Y2K crisis loomed, threatening to jeopardize businesses' computer records, companies rushed to scoop up Indian brainpower. They did this not because of the cheap cost of labor but because India was the only country with the volume of workers capable of doing the required programming.

The IT work these Indians participated in helped them develop relationships with a number of large companies in the United States and led to the burgeoning of Bangalore, India's very own Silicon Valley. Home to companies such as Microsoft, IBM, Goldman Sachs, Hewlett-Packard, and Texas Instruments, Bangalore has become a hub for knowledge workers. Companies such as these invested vast sums of money in bandwidth to connect Indian brainpower to American companies. The connections the IT workers made, coupled with the fact that India was now plugged into the global business society, led to tremendous opportunity for Indian knowledge workers.

And plugging in is precisely what young intellectual Indians are doing,

showing us how a science education combined with a personal computer, the right software, a modem, and ambition can lead to great opportunity and success. This attitude and philosophy is what defines India's knowledge workers, collectively known as zippies. More than half of India's population (54 percent) is under the age of 25. These 555 million young men and women are earning salaries nine times that of the country's average annual income, changing the social atmosphere of India and actively pursuing their fullest potential in the global society.

A national agenda

Ambition coupled with science and technology skills is helping young knowledge workers in countries such as India and China rise to a new level and compete with the rest of the world. The ability to send and retrieve information seamlessly across the globe has upped the ante for knowledge in the global society, and zippies are fully prepared to challenge themselves and others around the world.

Other developing countries face problems such as resistance to globalization. However, all countries will need to increase investments in higher education and encourage advancements in tertiary education with the

goal of increasing the availability of skilled labor and productivity. Business leaders interested in hiring a well-educated work force have already begun to view developing countries and their less-costly, skilled work force as critical resources.

In the 1960s, America was inspired by the Cold War to invest its efforts in science and technology; in 2006, it is globalization that should light a fire in America to achieve and prosper in the fields of science and technology.

In 2005, the U.S. Departments of Commerce and Education conducted a study analyzing K-12 student views about technology for learning and reported that "No concept drew greater interest from the student responders than some sort of an intelligent tutor/helper. Math was the most often mentioned subject for which tutoring help was needed. Many students desired such a tutor or helper for use in school and at home. In addition, there was significant interest in a single, all-knowing information resource."

A corporate agenda

Just as countries need to adapt to the changing global atmosphere, companies that hope to be successful must also address the challenges that globalization and knowledge dissemination create. Already many of the largest companies have begun mining the brainpower in China and India. For example, companies such as Dell, Accenture, Hewlett-Packard, and Microsoft are investing in projects and facilities in the burgeoning knowledge hubs of Dalian, China and Bangalore, India. As the flattening trend of globalization continues, companies will benefit by embracing technology and strategy that exploit the free flow of information allowed by globalization.

While countries and companies stand to benefit from the ease at which information can be shared, governments and corporations are just beginning to learn how to manage and pro-

Talent shortage

Top 10 jobs that employers are having difficulty filling across 23 countries and territories surveyed, ranked in order:

1. Sales representatives
2. Engineers
3. Technicians (primarily production/operations, engineering, and maintenance)
4. Production operators
5. Skilled manual trades (primarily carpenters, welders, and plumbers)
6. IT staff (primarily programmers/developers)
7. Administrative assistants/Personal assistants
8. Drivers
9. Accountants
10. Management/Executives

Source: "Talent Shortage Survey: Global Results," Manpower Inc., February 2006

protect knowledge- or technology-based economies. For instance, businesses that facilitate the creation of new technologies find that patents on information are difficult to obtain on the international level, where piracy and counterfeiting pose serious threats to specific industries. Several well-publicized data breaches have brought data security to the attention of U.S. lawmakers in 2005. With the flattening trend of globalization also comes the realization that any open landscape also requires the judicious placement of a few fences and gates.

The United States is still relying on patent, trademark, copyright, and trade secret laws as well as confidentiality procedures and contractual provisions to protect proprietary technology and brands. However, circumstances outside our control can pose a threat to intellectual property rights. For example, effective intellectual property

protection may not be available in every country in which a firm's products and services are distributed or the efforts taken to protect proprietary rights may not be sufficient. In addition, protecting intellectual property rights is costly and time consuming.

The problem of piracy for instance, is highly visible in the recording industry. Electronic file sharing programs for anyone's use have resulted in the loss of millions of dollars of potential music sales. Worldwide, the Motion Picture Association of America Inc. studios lost \$6.1 billion to piracy in 2005. The pirated music market, based only on the prices of pirated products sold, was estimated at \$4.6 billion in 2005. Part of the explanation is a lack of institutional capacity. Technology and economic transformation are outpacing international legal institutions, and governments must work with corporations to establish

more functional mechanisms for safeguarding investment in intellectual property.

Even as it poses a new set of business challenges, knowledge is now a necessary ingredient in the recipe for economic development. Businesses looking to remain competitive must be cognizant of how this global economy is taking hold. Current trends indicate that manufacturers will continue to relocate to countries with uneducated work forces and abundant, inexpensive labor. Similarly, corporations that rely on skilled labor will also invest where the work force is least expensive but still possesses the training and skills necessary to facilitate production.

Over the next 20 years, countries and companies alike must meet these exciting challenges presented by globalization by embracing technology and the knowledge economy. ♦

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