IEEE Internet Computing

www.computer.org/internet computing

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Vol. 13, No. 6
November/December 2009

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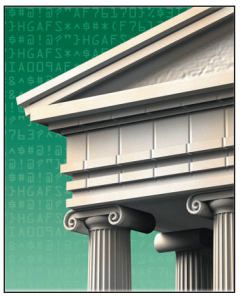

The World Is Digital

Daniel Castro and Scott Andes • *Information Technology and Innovation Foundation*

Debate rages on as to whether the world is flat, spiky, or "post-American." But all sides should be able to agree that IT is at the root of these transformations, and succeeding in a digital world requires knowledge and innovation.

IT-based globalization is everywhere: a university student in Pittsburgh enrolls in a class where her professor lectures via videoconference from Qatar; an emergency room doctor working in Chicago receives the results of a CT scan from a radiologist in Australia; a musician in London uses the Internet to collaborate with a vocalist in Russia to record the next indie hit. Globalization has been both celebrated for creating growth and democratizing nations and vilified for exploiting labor and destroying nature. But globalization in and of itself simply means the world is getting smaller and trade across borders is getting easier. Much of this change is driven by IT — by connecting the furthest corners of the world to global networks of information, IT has created a global economy in which workers must compete internationally and a global society in which ideas, culture, and trends know no borders.

The transition to a digital and connected world disrupts economies and creates new challenges, but it can also lead to economic growth and improvements in quality of life. How should policymakers respond? To answer that, let's take a look at some of the current debates on the impact of IT-driven globalization.

Is the World Flat, Spiky, or Post-American?

Thomas Friedman defined the debate over the challenges and impact of the new global economy when he decisively declared that "the world is flat."[1] In Friedman's terms, technology such as cell phones and broadband has helped "flatten" the world and has created a more connected economy powered via outsourcing and global supply chains. This means that a worker anywhere in the world — if he or she is part of the digital economy — can compete with workers anywhere else in the world. And IT-based competition can be intense: in some professions, outsourcing has evolved into *crowd sourcing*, in which only the best ideas win. For example, Web sites like CrowdSpring (www.crowdspring.com) provide a platform that lets businesses advertise a creative project and then choose the best submission to their project from designers all over the world.

Globalization's impact has important implications, not only for individual workers but also for market competitiveness. This column has previously explored the six "dirty little secrets" Friedman's flat-Earth philosophy raises for American competitiveness, including its declining international standing in education, workforce capabilities, funding, ambition, and infrastructure.[2] Indeed, a close look at the data reveals that the backbone of the US's global IT dominance to date — its education system, its leadership in emerging technologies, and its overall competitiveness — is in peril of dropping behind both developed northern European and developing Asian countries. Consider education, in which the students graduating from US universities, particularly those receiving graduate degrees in science, technology engineering, and mathematics fields, are increasingly foreign nationals. For example, 60 percent of the PhDs awarded in engineering at US universities go to non-US students.[3] The emerging question isn't whether the US is the best place to train future researchers, engineers, and scientists but where they'll put their skills to use after graduation. With a weak HB-1 visa program, many US-based IT firms are finding it increasingly difficult to

 1089-7801/09/$26.00 © 2009 IEEE

attract highly skilled, American-trained researchers and engineers. And many highly skilled, American-educated and foreign-born engineers and scientists are finding opportunities back home.

Not everyone agrees with Friedman that IT-driven globalization is creating a "flatter" world. IT-based globalization might create a level playing field for all sides, but that doesn't mean the score is tied at this point in the game. Others have argued that the world is characterized by increasing inequality in both developed and developing nations. For example, whereas Friedman sees a flat world, author Richard Florida sees the global landscape as one of "growing peaks, sinking valleys, and shifting hills."[4] Florida acknowledges that IT can have a leveling effect but points out that, when looking at global competitiveness, geography still matters: population, economic power, and innovative capacity are all concentrated among an elite group of urban centers — think of the technology hubs in areas like Silicon Valley in California, the Technology Corridor in Singapore, or the Multimedia Super Corridor in Malaysia. Or consider that, although less than 5 percent of the world's population resides in the US, it has approximately 14 percent of the total Internet users (see www.internetworldstats.com/top20.htm and www.census.gov/main/www/popclock.html).

Florida and Friedman actually aren't in disagreement. Friedman's flat world simply means that economic activity is increasingly able to, and does, locate in many more places around the globe; he doesn't suggest that it'll be spread like peanut butter equally across the landscape with no nodes or concentrations. Rather, those nodes are increasingly in nations outside the US. Florida notes that many of the "peaks" in the US appear to be eroding, and new innovation centers are rising up in locations such as Scandinavia and Asia. You can see this trend around the world as nations begin to think about green IT as the next IT revolution. Although the US has the potential to be a green IT leader, US leadership is by no means assured. Several nations have articulated national green technology strategies, with firm funding commitments. In South Korea, the Presidential Committee on Green Growth announced in July 2009 a five-year plan to spend a total of KRW 107 trillion (USD 87.7 billion) in green investment as part of its "Green New Deal" program. This investment represents an annual financial commitment equal to 2 percent of South Korea's GDP.[5] For the US to match this level of spending, it would need to commit more than $280 billion to its green technology efforts. Korea's Green New Deal includes a total of KRW 12 trillion (USD 9.5 billion) toward investment in developing green technology over the next four years. Of those funds, KRW 4.2 trillion will go to investing in areas such as green IT products, faster broadband networks, and energy-efficient transportation systems. South Korea will invest the remaining funds in R&D in 27 different green technologies, such as high-efficiency solar batteries, hybrid vehicles, high-efficiency LEDs, and smart-grid technology.[6]

Newsweek columnist Fareed Zakaria offers the primary challenge to the idea that the US is falling behind in terms of global IT leadership. In his book *The Post-American World*, Zakaria makes the case for how the global economic and political climate is shifting with "the rise of the rest,"[7] which, Zakaria explains, isn't about the US falling behind but rather falling in line with a changing reality in which no one country has an economic hegemony. He argues that, although the US no longer dominates the international economic landscape, it still isn't really in direct competition with other nations because its true economic power exists in the global supply chain's different levels. For example, Indian software programmers might gain market share in the production phase of the supply chain, but at the R&D back end and the commercialization front end — where the money is — the US has irrefutable market dominance.

Zakaria's argument is problematic for several reasons. First, both China and India have concerted strategies to move up the value chain and not simply be commodity producers. India's proactive technology policies are showing results. For example, when selecting India for its new globalization center in 2006, Cisco CEO John Chambers stated, "Cisco chose India as the location from which to expand its globalization vision because India has a highly skilled workforce, supportive government, innovative customers, and world-class partners that already have global capabilities."[8] Second, he dismisses the economic challenges larger nations face from smaller nations. However, in a growing global economy, competitiveness isn't as associated with size as it is with being a first mover within technological frontiers. The Scandina-

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vian countries have created national strategies to produce in high-value-added industries and have created global market opportunities beyond their size through public and private partnerships and rigorous investments in science and R&D. For example, Nokia, the world's largest mobile phone manufacturer, is based out of Finland and accounts for 3 percent of the Finnish GDP.[9] In reality, northern Europe has become a global leader in many IT-based competitiveness indicators, such as in broadband speed and penetration rates and the number of scientific researchers.[10] The other problem with dismissing the innovative potential of small countries is that when taken together, emerging innovative nations, such as the Scandinavian countries, Singapore, South Korea, and several of the Baltic countries, could create a critical mass that would rival the US in international competitiveness. In a global economy, it makes little difference whether global competition comes in the form of one big country or many small countries because the outcome is likely to be the same.

Is IT a Forklift or a Microphone?

A second debate of interest to policymakers revolves around the question of whether IT is a great equalizer or a great enabler. As UCLA professor Edward Leamer asks, "is a computer a forklift or a microphone?"[11] In other words, is IT a force for eliminating advantages or amplifying them? The answer is that it's both, depending on what part of the value chain you're in. For simple tasks such as typing a manuscript or reading an x-ray, IT is a forklift in that regardless of your abilities, with a little training, everyone can "lift" the same amount. It's this element of IT that has helped create the Indian software and Chinese manufacturing boom. On the other hand, IT has also created greater opportunities for building on existing skill advantages. For example, before the IT revolution, lawyers and architects spent much of their time actually drawing up documents or plans. Now, with IT innovations' automation and transaction power, those tasks take significantly less time or can simply be done by someone else, somewhere else — leaving the lawyer or the architect more time to focus on the skilled elements of his or her job. In this sense, IT is a microphone because its value depends upon the user's skills. But, at the end of the day, the widespread productivity benefits from IT (the forklift effect) promise to vastly outweigh the specialized advantage benefits.

But that doesn't mean that because of the new IT-enabled division of labor that more developed nations can't and shouldn't seek to gain advantage. Countries that develop sound public-private partnerships to coordinate R&D and allow for greater IT development tend to get further ahead in the IT-driven global economy. For Leamer, high-value production is about "relationships, not markets." Just as Microsoft probably won't set up a new R&D lab in Bangladesh solely on the basis of low labor costs, it also won't keep all its R&D labs in the US when other nations offer better national innovation systems that enable coordination between firms, universities, and the government.

Intel's move to Israel is a good case in point. Intel originally decided to develop an R&D plant to create its 64-bit microprocessor in Israel (in part because Israel's R&D tax credit is far more generous than the US's). Shortly thereafter, the company invested US$4 billion to create a manufacturing plant in Israel as well. Greg Tassey, senior economist for the US National Institute of Standards and Technology, explains that Intel's actions make sense "because much of the knowledge produced in the early phases of a technology's life cycle is tacit in nature, and such knowledge transfers most efficiently through personal contact."[12] The US is good at creating efficient markets, but, in the new economy, it needs to be far better at developing economic relationships if it wants to stay competitive with other countries.

Is This All a Lot of "Globaloney"?

A final relevant debate to policymakers is the extent to which globalization is a reality or a mirage. Not everyone agrees that talk about a globalized economy is warranted. Harvard Business School professor Pankaj Ghemawat argues that the idea of a globally connected world is so far an unfulfilled prophecy.[13] Ghemawat cites data showing only approximately 10 percent of telephone calls, Internet traffic, charitable donations, and investments are international to make the case that we aren't living in a globalized environment. He notes that even in areas of seemingly high global integration — cities like Hong Kong, New York, and London — people choose to do business locally even when they could do it globally. This shouldn't be too surprising because, as the saying goes, "it's not what you know, it's who you know," and people tend to know their neighbors. For example, although people might spend more time online, the average user isn't using this time to make new friends on the other side of the world, but rather to chat with friends on the other side of the city.

Although Ghemawat argues that the trend might or might not be moving toward more globalization, it's less debatable that the trend is one of digital transformation. Most US Internet users might not have a Facebook friend in Iran, but much of the news on the disputed election in Iran came through Twitter. And although most donations in the US

go to domestic charities, Web sites like Kiva let individuals loan money directly to individuals in low-income countries. Moreover, around the world, nations are embracing IT as the key to improving not just economic productivity but also quality of life in areas such as health, education, transportation, and government. What this means is that there's no escaping the fact that individuals and countries must be ready to compete in a digital economy.

What can policymakers in the US learn from these different debates? The debates between Friedman, Florida, and Zakaria suggest that the global landscape is shifting. For the US to remain an international leader in IT, it must make significant investments in education, science, and R&D. Leamer's work suggests that the US must focus on training a highly skilled workforce and creating a national innovation system that enables coordination between firms, universities, and the government. Finally, Ghemawat's work serves as an important reminder that globalization isn't necessarily predestined because government leaders must resist protectionist policies spurred on by populist movements and the discontents of globalization that promote isolation and inefficiency. IT still can't avoid legal obstacles such as trade barriers, immigration policy, or restrictions on data flows — these are in the hands of policymakers. And digital disintermediation — the elimination of the middleman due to IT-based efficiencies — means that there will always be a steady supply of economic losers to push back against pro-innovation and pro-technology policies. For example, optometrists have resisted the online sales of contact lens by claiming to protect public health, and car dealers have objected to auto manufacturers selling directly to the public online to protect consumers.[14] Although it could be politically difficult, policymakers must side with the public interest rather than special interests.

IT won't erase all of the cultural and geographic barriers to globalization such as language, time zones, and physical proximity. However, IT is lessening the burden. The past few years have seen the maturation of online collaboration tools such as Microsoft SharePoint, Google Apps, and Cisco TelePresence. And social networking applications such as LinkedIn are helping people establish and maintain international professional networks with less need for face-to-face interactions. Finally, if nations want to reap more of the rewards of IT-based globalization and suffer less of its ill-effects, their policymakers must address the internal challenges threatening long-term competitiveness and create robust national innovation policies to support international competitiveness.

References

1. T. Friedman, *The World is Flat*, Farrar, Straus, and Giroux, 2005.
2. S. Ruth and A. Pizzato, "Is the World Still Flat? An Update," *IEEE Internet Computing*, vol. 11, no. 5, 2007, pp. 77–81.
3. S.J. Ezell and R.D. Atkinson, "RAND's Rose-Colored Glasses: How RAND's Report on US Competitiveness in Science and Technology Gets it Wrong," *The Information Technology and Innovation Foundation*, Sept. 2008; www.itif.org/index.php?id=174.
4. R. Florida, "The World is Spiky," *Atlantic Monthly*, vol. 296, no. 3, 2005, p. 48.
5. "Gov't Unveils Plan To Be Among the Top Green Nations," Korea.net, Jul. 2009; www.korea.net/News/issues/issueDetailView.asp?board_no=20963.
6. "Korea to Invest 12 Trillion Won to Spearhead Green Growth," Korea.net, May 2009; www.korea.net/news/issues/issueDetailView.asp?board_no=20754.
7. F. Zakaria, *The Post-American World*, W.W. Norton, 2008, pp. 1–5, 187–191, and 209–210.
8. "Cisco Selects India as Site for the Cisco Globalization Center," Cisco, Dec. 2006; http://newsroom.cisco.com/dlls/global/asiapac/news/2006/pr_12-06c.html.
9. J. Ali-Yrkkö, "The Role of Nokia in the Finnish Economy," *The Finnish Economy and Society*, vol. 1, 2001, pp. 72–80; www.etla.fi/files/940_FES_01_1_nokia.pdf.
10. R.D. Atkinson and S.M. Andes, "The Atlantic Century: Benchmarking EU & US Innovation and Competitiveness," *The Information Technology and Innovation Foundation*, Feb. 2009; www.itif.org/files/2009-atlantic-century.pdf.
11. E.E. Leamer, "A Flat World, a Level Playing Field, a Small World After All, or None of the Above? A Review of Thomas L. Friedman's The World Is Flat," *J. Economic Literature*, vol. 45, no. 1, 2007, pp. 83–126.
12. G. Tassey, "Globalization of Technology-Based Growth: The Policy Imperative," *J. Technology Transfer*, vol. 33, no. 6, 2008, pp. 560–578.
13. P. Ghemawat, "Why the World Isn't Flat," *Foreign Policy*, vol. 159, no. 2, 2007, p. 54.
14. R.D. Atkinson, "The Revenge of the Disintermediated: How The Middleman Is Fighting E-Commerce and Hurting Consumers," Progressive Policy Inst., 2001; www.ppionline.org/documents/disintermediated.pdf.

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