

They need objective assessment and federal and state support to be heard and adopted on a national level.

Ironically, such a blunt, hands-off approach also makes it harder when, in finance, we actually have too much innovation. While it is hard to imagine the downside to too much R&D in, say, auto manufacturing, economist Simon Johnson and entrepreneur James Kwak argue that, too often, financial innovation merely increases risks without increasing social value—indeed, this is precisely what happened in the 2000s, during which a hands-off regulatory approach led to wildly profitable yet wildly risky financial innovations and, inevitably, the collapse of the Jenga tower that was Wall Street circa April 2008. The diagnosis is different, but Johnson and Kwak’s prescription is the same: Financial regulators need to view innovation not as a magic process we can never hope to understand, but as an economic force that can be regulated, guided, and fostered.

True, we don’t know exactly which innovations will drive growth in the next half-century, just as no one could have predicted the power of the Internet 30 years ago. And yet the Internet was itself the product of a bygone era in which the government wisely invested in R&D and product development, then ushered their results into the marketplace. Fortunately, there is a lot we can do, as Brookings’ Howard Wial and Cornell’s Susan Christopherson demonstrate with their proposals for, respectively, a national innovation foundation and federal investment in agile “phoenix” industries that are rising in former manufacturing cities.

The next Internet—or steam engine, or biomedical breakthrough—won’t emerge because we simply lower taxes, lighten regulation, close our eyes, and pray. It will emerge because of concerted public efforts to boost R&D, product development, and marketing, all things that the rest of the world does with ease. It’s high time America got in the game.

America and the World: We’re No. 40!

Stephen Ezell

In Japan, citizens check in to airlines, pay transit fares, and bank through their cell phones. Average broadband speeds in 15 countries are faster than in the United States. And in Finland, virtually all primary care physicians use electronic health records. Germany leads the United States in innovation and development of solar cells, Denmark leads in wind power, Japan leads in

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robotics, and the rechargeable lithium-ion batteries at the heart of GM's vaunted all-electric Volt were designed and manufactured in South Korea.

Not long ago, America's global leadership in technology innovation was taken as a given. Research from U.S. corporate, academic, and government laboratories reeled off a string of transformative innovations, in everything from transistors, mobile phones, and personal computers to lasers, graphical user interfaces, search engines, the Internet, and genetic sequencing. But other countries have since closed the innovation gap, and in many cases far outpaced the United States. What happened to America's advantage?

Over the past decade, many of our competitors—from Great Britain and Finland to Japan and South Korea—have created national innovation strategies designed specifically to link science, technology, and innovation with economic growth. These countries proactively anticipate and articulate the intersections among policies in science and technology, R&D, education, workforce training, immigration, tax, trade, intellectual property, and digital infrastructure in creating economic and social welfare. In turn, they have formed innovation institutes to coordinate policy in all these areas.

They have done so because they recognize that technological innovation drives long-run economic growth and that therefore innovation-led economic development must be a focal point of their economic growth strategies. They further recognize that addressing complex and systemic challenges—such as expanding health care, deploying digital infrastructure, achieving sustainable energy production, combating climate change, and producing a skilled, world-class workforce—can only be accomplished through coordinated strategies that leverage the resources of government, industry, and academia. As Rui Grilo, chief of staff for Europe's Lisbon Strategy and an architect of Portugal's innovation strategy, bluntly states, "Knowledge, technology, and innovation must be at the core of a country's national economic policy."

Unfortunately, the United States, practically alone among the world's leading economies, conspicuously lacks both a national innovation strategy and an institution to advance one. Once generally recognized as the world's innovation leader, in recent years the United States has begun to slip noticeably. In February 2009, the Information Technology and Innovation Foundation's (ITIF) *Atlantic Century* report ranked the United States sixth out of 40 leading industrialized nations in innovation competitiveness. A March 2009 Boston Consulting Group study ranked the United States eighth out of 110 countries. While those figures aren't so bad, consider this: ITIF's report examined the rate of change in innovation capacity over the last decade for 40 countries and found the United States ranked dead last in improvements across a range of 16 key metrics in human

capital, innovation capacity, entrepreneurship, IT infrastructure, economic policy, and economic performance.

America's last-place performance in enhancing its innovation capacity over the past decade is a direct reflection both of other countries' articulation and aggressive implementation of national innovation strategies, and the United States' corresponding lack thereof. It's also a function of an entitlement mentality that believes policies that were good enough to assure U.S. innovation leadership in the past will be sufficient to maintain that leadership in the future. And while the United States once led the way in developing pro-innovation policies—it was the first in the world to offer companies an R&D tax credit and, through the 1980 Bayh-Dole Act, the first to allow universities to patent products originating from federal R&D funds—other countries' innovation policies have caught up, and in many cases surpassed, those of the United States. For example, U.S. R&D tax credit generosity has fallen to 17th for large companies (18th for small and medium-size enterprises) among OECD countries, and whereas the United States offers only an incremental R&D tax credit, the most aggressive countries have gone to a flat tax credit for R&D expenditures.

In short, other countries have caught up by adopting the best American lessons of free and open markets and complementing them with smart support from government to grow the innovation capabilities of their firms and industries. And while the United States remains near the top of the world's most innovative countries, it remains so based primarily on residual innovation strengths, not new capabilities it has assembled over the past decade. As Harvard's Gary Pisano frames America's challenge, "The competitive advantage of the U.S. economy has to be leveraging our science capacity for economic growth." Looking at how well other countries have done just that, America has a long way to go.

The countries that lead the world in innovation policy took a three-step approach: They recognized the need to approach innovation systemically; they set a vision and strategy for action, with clearly articulated goals and ambitions; and they implemented institutional reforms to drive their country's innovation strategy. Take Finland. Its National Innovation Strategy, released in March 2009, emphasizes the need for a national approach to innovation, arguing that "piecemeal policy measures will not suffice in ensuring a pioneering position in innovation activity, and thus growth in national productivity and competitive ability." That's why the country placed Tekes, its National Agency for Technology and Innovation, within the Ministry of Employment and Economy, making explicit the linkage between innovation, employment, and economic growth.

The most innovative countries send senior delegations around the world, learning the best innovation policies others are implementing, and operate “innovation outposts” in foreign countries to identify emerging technologies and commercialization strategies. But as Greg Tassej, senior economist for the U.S. National Institute of Standards and Technology (NIST) noted recently, “Senior foreign government delegations still frequent the U.S. on technology visits, but they come increasingly infrequently to the U.S. to learn about innovation policy; there’s much more for them to learn in Europe and Asia.” In contrast, the United States has invested little in learning and applying innovation lessons from foreign competitors. Investors would never accept a company that didn’t relentlessly benchmark its practices against those of its peers. Americans should accept nothing less regarding U.S. innovation policy.

The next step is setting a vision for action with clearly articulated goals. Seven governments with standout national innovation strategies—Denmark, Finland, Ireland, Japan, Singapore, South Korea, and Sweden, plus others like Canada and Australia—have publicly declared an aspirational goal

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to lead the world in transitioning to a digital economy, including ensuring that all a country’s citizens have access to high-speed broadband connections, that the population is digitally literate, that government places services online, and that information technologies suffuse a country’s transportation, energy, and health networks. Indeed, among leading innovative countries, only the Netherlands and the United States lack a clearly articulated national broadband strategy (although the Federal Communications Commission is expected to release one by Spring 2010.) Just as the moon landing would not have happened without clear leadership and government funding, so will the United States be unlikely to lead the world in transitioning to the digital economy.

The final, yet most critical, step is creating effective new institutions and policies to drive a country’s innovation agenda. For many countries, that has meant either launching an entirely new innovation agency (similar to what Howard Wial proposes in “A National Innovation Foundation,” on page 37 of this issue) or consolidating the activities of legacy agencies into a reorganized mission. India launched its National Innovation Foundation in 2000, Sweden introduced Vinova in 2001, Thailand created a National Innovation Agency in 2003, and the Netherlands launched Senter Novem in 2004. Just this June, the United Kingdom launched a Department for Business, Innovation, and Skills, along with a \$230

million fund to invest in technology-based businesses with high growth potential. These countries' innovation agencies perform roles such as channeling R&D into specific technology or industry research areas; surveying the world to identify nascent technologies; building technology "roadmaps"; creating new knowledge pertaining to the methods, processes, and techniques of innovation; transferring knowledge from academia and government to the private sector; encouraging private-sector technology adoption; catalyzing industry-university research partnerships; supporting regional industry "technology clusters"; developing national innovation metrics; and championing innovation in the public sector.

Some countries' innovation policies specifically target industries in which they intend to lead the world. Singapore, for example, has targeted life sciences, digital media, and water/environment and invested heavily in them. In 2003, Singapore launched Biopolis, a two-million-square-foot biomedical research center, which by 2015 is meant to attract 4,000 of the world's preeminent biomedical researchers; nearby, Singapore's Fusionopolis houses 6,000 scientists in fields including materials science, clean technology, and digital media. Finland's innovation strategy targets global leadership in six key industries: information and communications technology, healthcare, energy and the environment, construction, forestry products, and mechanical engineering; for each industry, Finland has created a Strategic Center for Science, Technology and Innovation (SHOK), a research partnership in which companies, universities, and research institutes agree on a joint strategic technology research agenda for the industry. Both Finland and Singapore also endeavor to compete on their "brands" as innovation nations; just like Apple, they market themselves as attractive hotbeds of creativity and innovation (with the requisite skills and infrastructure) in an effort to lure talent and corporate foreign direct investment.

Recognizing that the skills of their workforce form the fundamental source of their competitive advantage, leading countries have made education a core element in their innovation policies. Finland has set a goal that all its high school graduates be equipped with the technical, analytic, and communications skills to compete in a global economy the day they graduate from high school. It also consolidated three of its institutes of higher learning—the Helsinki School of Economics, the University of Art and Design Helsinki, and the Helsinki University of Technology—into a single institution, Aalto University, that by 2020 is meant to be one of the world's leading academic institutions at combining business, technology, and design. Sweden introduced universal school vouchers in a sweeping reform to enhance the competitiveness of its secondary education system.

Tech transfer is also a frequent focus. The Netherlands' innovation agency, Senter Novem, recently introduced an Innovation Vouchers program designed

to enable small- and medium-sized companies to buy knowledge from public research institutions, universities, or large corporations. Senter Novem attributes 80 percent of new R&D jobs created in Holland since 2005 to the vouchers and reports that eight out of ten vouchers resulted in an innovation that would not have otherwise come to fruition.

Why have these countries made so much progress while the United States has made so little? For several—notably Finland, Ireland, Singapore, and Portugal—development of national innovation strategies and institutions arose as a response to severe economic crises. They followed the logic of Mancur Olsen’s 1982 *The Rise and Decline of Nations*, which argues that countries whose economic foundations have suddenly been shaken tend to grow and innovate faster than more stable nations, as dramatic change becomes an issue of national survival.

Such moments of clarity led them to recognize that the globalization of innovation production and consumption has forced countries to move from being price takers to price makers in international markets. In other words, corporations now shop countries to find the most attractive markets—based on tax rates, workforce skills, infrastructure, and the presence of technology clusters—in which to locate R&D, production, and management activities. For example, Intel’s recent decision to locate a semiconductor manufacturing plant in China instead of the United States was driven in part by the recognition that it can cost \$1 billion more to build, equip, and operate a factory in the United States than it does outside, with 70 percent of the cost difference accounted for by lower taxes, and 90 percent of the cost difference explained by government policies (including grants and tax credits), not wages.

This occurs, to some extent, at the state level domestically. Many governors, regardless of their politics, recognize that while markets create prosperity, they don’t always generate prosperity for their citizens. The next 1,000 high value-added jobs could just as easily be created in another state or another nation. Thus, forward-thinking governors understand the necessity of not letting the market alone determine the location of high value-added economic activities, leading them to enact activist economic development policies such as workforce development programs, industry-university research centers, and R&D tax incentives. Why doesn’t our federal government do the same internationally?

Perhaps the most important explanation for these countries’ success with innovation policy is that they are not dominated by a neoclassical economic belief system that views any government engagement in the economy as inherently pernicious. They understand that government can play a constructive and proactive role in fostering national economic competitiveness. Skeptics of the

need for a U.S. innovation policy contend that government involvement in markets upsets the invisible hand that produces optimal economic welfare and is tantamount to industrial policy. But U.S. policy needs to discard the “black-box” model still clung to by neoclassical economists, in which technology is viewed as a pure private good, and instead adopt the model evolving worldwide that recognizes the public-good content of elements of industrial technology and hence the need for government support. As Philip Rycroft, an official spearheading development of Britain’s innovation strategy, explains, “We’re determined not to second-guess the future by trying to pick winners and losers, but we do think government can create the conditions so that new industries can rise more easily.”

Other innovation-policy skeptics argue that countries held out as innovation leaders are too different to be models; that they are too small, have unitary instead of federal government structures, or have different cultures than ours. But the range of countries that have established effective innovation strategies and agencies—from Denmark and Singapore to Japan, the United Kingdom, and South Korea—include large and small countries alike, federal and unitary government structures, and a multitude of cultures.

To be sure, the Obama Administration has begun to make some moves in the right direction: appointing the nation’s first Chief Technology Officer; providing \$100 million in grants for the development of regional clusters of high technology-focused areas; directing the Bureau of Economic Analysis to measure the role of innovation in the economy; and promoting green R&D and digital infrastructure investments in broadband, health IT, and the smart grid as part of the stimulus package.

While we should acknowledge and applaud these efforts, the need remains for a coordinated national innovation strategy that synthesizes many disparate initiatives and activities into a coherent approach. To diagnose the recession as solely caused by poorly managed financial markets misses the fact that a decade’s worth of investment that should have gone into infrastructure and technological innovation instead went to inflate asset bubbles that have since popped, leaving little residual value to boost future economic productivity. Moreover, it misses a fundamental global economic reordering: All countries now recognize the need to migrate up the economic value chain—from manufacturing commodities to competing with the United States to produce the highest value-added technology- and knowledge-intensive goods and services.

BusinessWeek reported in April that three million U.S. jobs had gone unfulfilled over the prior year, even as unemployment climbed toward 10 percent, because our workforce lacked necessary skills. The United States is increasingly

at a deficit against international competitors with a gameplan to position their workforces to compete and win in the most lucrative sectors of technology and innovation-based economic activity. It would be inexplicable for the country not to approach the current economic crisis as an opportunity to likewise place technology and innovation at the center of its economic growth strategy and to build the institutions that will provide the framework for sustained innovation, long after the recession abates. ▀

Finance: Before the Next Meltdown

Simon Johnson and James Kwak

If innovation must be good, then financial innovation should be good, too. If finance is the lifeblood of our economy, then figuring out new ways to pump blood through the economy should foster investment, entrepreneurialism, and progress. Right? This, in any case, has been the mantra throughout three decades of deregulation and expansion of the financial sector.

And yet today, financial innovation stands accused of being complicit in the financial crisis that has created the first global recession in decades. The very innovations that were celebrated by former Federal Reserve Chairman Alan Greenspan—negative-amortization mortgages, collateralized debt obligations (CDOs) and synthetic CDOs, and credit default swaps, among countless others—either amplified or caused the crisis, depending on your viewpoint. The journalist Michael Lewis recently argued that the credit default swaps sold by A.I.G. brought down the entire global financial system—and found that the A.I.G. traders he talked to completely agreed.

Recent financial innovation is not without its defenders, of course. As current Fed Chairman Ben Bernanke said in a speech in May:

We should also always keep in view the enormous economic benefits that flow from a healthy and innovative financial sector. The increasing sophistication and depth of financial markets promote economic growth by allocating capital where it can be most productive. And the dispersion of risk more broadly across

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