

Building Blocks of An Innovation System

The steady dissemination of change can't be left to "inspiration." Synergistic policies on the part of government, finance, industry and the educational sector are vital for the creation of an innovation-friendly environment.

IN THE CONVENTIONAL VIEW, innovation is something that just takes place idiosyncratically in "Silicon Valley garages" and research and development (R&D) laboratories. But, in fact, innovation in any nation is best understood as being embedded in a national innovation system (NIS). Just as innovation is more than simply putting together science, technology and business, an innovation system is comprised of more than those elements directly related to the promotion of science and technology. It includes all the economic, political, and social institutions affecting innovation (e.g., a nation's financial system; organization of private firms; the pre-university educational system; labor markets; culture, regulatory policies and institutions, etc.). A national innovation system is the entire network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies."

It is one thing to invent and even institute an innovation. It is something rather different to create an environment that promotes the steady stream of innovations and their dissemination upon which nations and economies depend for continuing prosperity.

One way to conceptually organize all the factors determining the pace and breadth of innovation in a nation is to visualize an "innovation success triangle," with business environment factors along one side of the triangle, the trade, tax and regulatory environment along another, and the innovation policy environment along the third. Success requires

correctly structuring all three sides of the innovation triangle.

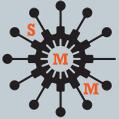
THE BUSINESS ENVIRONMENT includes the institutions, activities, and capabilities of a nation's business community as well as the broader societal attitudes and practices that enable innovation. Factors specific to a successful business environment include: high-quality executive management skills; strong IT (or as many other nations refer to it, ICT—information and communications technology) adoption; robust levels of entrepreneurship; vibrant capital markets that support risk taking and enable capital to flow to innovative and productive investments easily and efficiently; and a business investment environment that strikes

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the right balance between short- and long-term goals. Broader factors include: public acceptance and embrace of innovation, even if it is disruptive; a culture in which inter-organizational cooperation and collaboration is embraced; and a tolerance of failure when attempting to start new businesses. ...

AN EFFECTIVE TRADE, TAX AND REGULATORY ENVIRONMENT features a competitive and open trade regime, including serious efforts by government to





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Despite the high quality of the U.S. managerial class, pressures for short-term performance and profits tends to reduce their ability to make the sort of long-term investment that fuels innovation.

protect its businesses against foreign mercantilist practices; support for competitive markets such that new entrants, including those introducing new business models, can flourish; processes by which it's easy to launch new businesses and to bring innovations to market; transparency and the rule of law; a reasonable business tax burden, especially on innovation-based and globally traded firms; a strong and well-functioning patent system and protection of intellectual property; regulatory requirements on businesses that are based on consistent, transparent, and performance-based standards; limited regulations on the digital economy; limited regulations on

labor markets and firm closures and downsizing; a balanced approach to competition policy; and government procurement based on performance standards as well as open and fair competition. Nations need a regulatory climate that supports rather than blocks innovators and that creates the conditions to spur ever more innovation and market entry, while at the same time providing more regulatory flexibility and efficiency for industries in traded sectors. ...

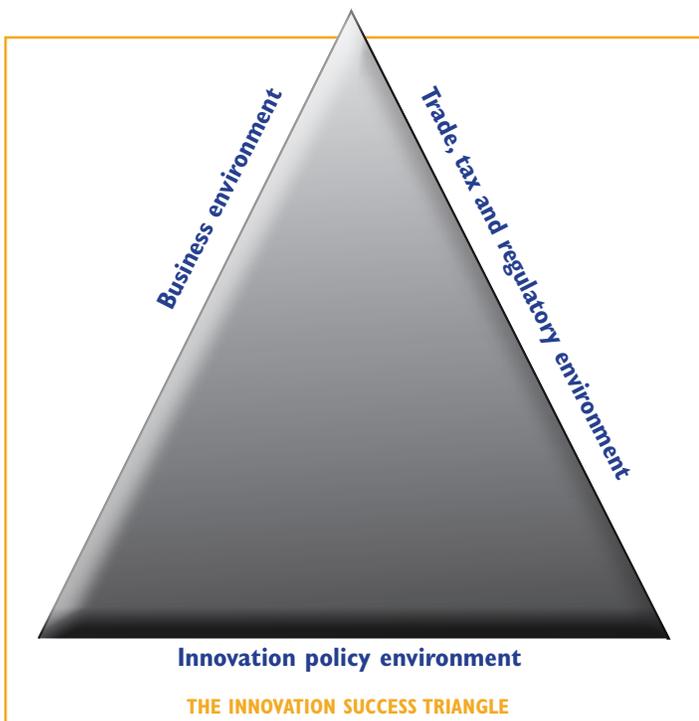
A SUCCESSFUL INNOVATION POLICY SYSTEM includes: generous support for public investments in innovation infrastructure (including science, technology, and technology transfer systems); support for digital technology infrastructures (such as smart grids, broadband, health IT, intelligent transportation systems, e-government, etc.); targeting R&D to specific technology or industry research areas; funding sector-based industry-university-government research partnerships; reshaping the corporate tax code to spur innovation and IT investment, including R&D and capital equipment and software incentives; a skills strategy, including high-skill immigration and support for science, technology, engineering, and math (STEM) education; encouraging private-sector technology adoption, especially by small and mid-sized manufacturers; supporting regional industry technology clusters and regional technology-based economic development efforts; active policies to spur digital transformation in the private and nonprofit sectors; and championing innovation in the public sector.

The American Innovation System

America's industrial innovation, prior to WWII, was powered principally by private inventors and firms. After WWII, a more science-based system of innovation emerged, which would become dominated by large firms and the federal government. The establishment of large, centralized corporate R&D laboratories helped drive innovation in an array of industries, including electronics, pharmaceuticals and aerospace.

Still, the explicit promotion of innovation and productivity as an economic goal was largely ignored and even rejected through most of the post-war period. Attempts by the federal government to explicitly support commercial innovation were made in fits and starts and never really got off the ground.

This began to change in the late 1970s with the emergence of competitiveness challenges from nations like Japan and Germany. It was with the election of President Jimmy Carter in 1976 that the federal government began to focus in a more serious way on the promotion of technology, innovation, and competitiveness. The motivation for this was



the major recession of 1974, the shift in the U.S. balance of trade from one of surplus to one of deficit, and the growing recognition that nations like France, Germany, and Japan now posed a serious competitiveness challenge to U.S. industry. At this point, a host of major policy innovations created a long list of alphabet soup programs to boost innovation.

By the time Bill Clinton was elected in 1992, America's competitiveness challenge appeared to be receding. Japan was beginning to face its own problems, and Europe was preoccupied with its internal market integration efforts. Moreover, with the rise of Silicon Valley as a technology powerhouse and the rise of the Internet revolution and companies like Apple, Cisco, IBM, Intel, Microsoft, and Oracle, America appeared to be back on top, at least when it came to innovation.

But while IT was thriving, U.S. industrial competitiveness was not. The United States lost over one third of its manufacturing jobs in the 2000s, mostly due to falling international competitiveness, not superior productivity of competitors.

Renewed Attention to Innovation

After the losses of the 2000s, the Great Recession and the emergence of robust new technological competitors, including, but not limited to China, the state of U.S. industrial innovation and competitiveness has gained renewed attention. Because of this, the Obama administration has proposed a number of initiatives, including the establishment of a National Network of Manufacturing Innovation; an expansion in the research and experimentation (R&D) tax credit; increased funding for science agencies; policies to expand the number of STEM graduates; patent reform; and increased efforts to limit unfair foreign policies. Congress has also introduced a variety of similar measures.

These measures are helpful, but not necessarily defining. The U.S. innovations system has many positive aspects, but also several characteristics that pose a problem to innovation. Despite the high quality of the U.S. managerial class, firms are buffeted by pressures for short-term performance which, in turn, reduces their ability to invest for the long-term. A focus on maximizing short-term returns does make companies effective in reducing waste and pulling the plug on poor investments, but pressure to achieve short-term profits can also result in sacrificing the long-

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The nation that can put together all three sides of the innovation success triangle most effectively is likely to be the nation that reaps the rewards in greater economic vitality and prosperity.

term investment which fuels innovation.

To this, add a tax system that does not always foster investment and an inconsistent regulatory climate that stifles innovation, both of which have grown over the last decade. While America still largely tilts toward innovation, anti-innovation forces in U.S. culture appear to be stronger today than ever before in American history. Whether it is fears of job loss from automation, privacy loss from the Internet, or environmental damage from nano-tech or biotech, anti-technology forces—in the media, “public interest” groups, and the public at large—have expanded, making it harder for the U.S. economy to press ahead with innovation....

ON THE PLUS SIDE, U.S. FIRMS are among the world leaders in adoption of information and communications technologies and invest more as a share of sales and of overall capital investment in hardware, software, and telecommunications than almost any other nation.

Also, a cultural bent toward “venturesome consumption” on the part of American consumers—that is, their eagerness to be early adopters of and experiment with new products and technologies—has played a role in supporting U.S. innovation success.

In recent years the concept that while innovation is about competition, it’s also about “coopetition” and cooperation—in other words, groups working together to drive innovation—has taken hold. The culture of collaboration in places like Silicon Valley and Boston’s Route 128 is one of the keys to their success. Likewise, the ability of leading U.S. universities to work cooperatively with industry has been key to driving regional innovation hubs and clusters. These collaborative learning systems are supported in part by strong intellectual property (IP) protections.

The concept of innovation clusters has been long understood by regional planners, but it wasn’t until Harvard Business School Professor Michael Porter popularized the notion of clusters in the 1990s that many governments in the U.S. began to focus more explicitly on spurring innovation clusters. The emergence of high-profile clusters, such as Silicon Valley and North Carolina’s Research Triangle Park, lent credibility to the notion that innovation clusters can power innovation and growth. Explicit innovation cluster policies have been the province of states and sub-state regions, in part because these units of governments are “closer to the ground” and have a better sense of which clusters are important.

As nations compete to win the global innovation race, some will sprint out ahead, others will remain stuck in the middle of the pack, and still others will struggle to get out of the starting gate. Nations face different challenges in the race. No nation has it entirely right just yet, although a few come close. While some nations—such as Japan and much of Europe—have strong innovation policy systems, many of them suffer from limited regulatory and business environments.

In contrast, the United States has reasonably good business and regulatory environments but a weak innovation policy environment. The nation that can put together all three sides of the innovation success triangle most effectively is likely to be the nation that wins the race and reaps the rewards in greater economic vitality and prosperity. Thus, the challenge for the United States going forward is whether it can make the needed changes to its innovation system to meet the new competition. Our economic future will depend on the answer.