

CERA Week 2009, Special Plenary: Models of Innovation by
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Good afternoon.

Appropriate infrastructure is essential for economic growth. To foster growth from the extant “knowledge economy 2.0” to a new energy innovation economy, we must build a vibrant innovation ecosystem, as the foundation of that infrastructure.

CONTEXT

Let me set the context. We, obviously, are at a time of exceptional uncertainty and enormous change, when our nation, and the entire world, face challenges perhaps greater, and more intricate, than ever before.

The triple-linked vulnerabilities of energy security, global climate change, and the global economic downturn, offer our nation, and the entire globe, both tremendous risk and enormous opportunity.

An unprecedented series of financial market events and their ensuing economic impacts — echoing in markets and economies around the globe — have forced us to relinquish past assumptions and former remedies. The geopolitical and geostrategic consequences are still evolving, and the outcomes are not yet clear.

Here in the United States, we are unsure of our own economy. We have burgeoning bankruptcies, foreclosures, layoffs, job loss, bank instability, credit constriction — and, if available, more expensive credit, sinking corporate profits, and an additional national deficit that will likely reach over \$1 trillion, as the full costs of a financial institutions bailout and economic stimulus are felt.

Nor are we alone.

- China is implementing a stimulus package of its own.
- Great Britain is staving off new bank failures, swelling unemployment, and protectionist sentiment.
- Russia’s economy is struggling, as global price of oil has fallen.
- And even amid a global economic crisis, nations seek energy sources of every kind and the advanced technologies to extend, augment, and conserve them.

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National alignments have shifted, as global power shifts — based on the geography of energy and other natural resources. New player nations, such as Russia, Brazil, India, and China have held new sway in the international sphere.

But, new discoveries, new innovations, and new technologies are continually shifting the landscape. In fact, many believe that a time of crisis is just the time to innovate. I returned recently from the annual meeting of the World Economic Forum in Davos. Although its primary focus was on global economic recovery, GE Chairman and CEO Jeffrey R. Immelt noted that, even in the midst of crisis, “Companies and countries that really play offense vis-à-vis technology and innovation are going to come out ahead.” What I believe he means is that, even in the global recessionary environment, new forces, new players, new markets, a focus on climate change, and new technologies will be major drivers of global energy system restructuring, and create opportunity for those who innovate.

Within this context, what, then, are new models of innovation?

There are two ways to talk about new innovation models:

- The first is through pathways to new technological innovation to meet global challenges. Dr. Peter H. Diamandis, will share an important new model shortly.
- The second focuses on the elements necessary for an innovation ecosystem to thrive. This is what I will, briefly discuss.

In 2004, the Council on Competitiveness undertook a year-long National Innovation Initiative, led by Sam Palmisano, Chairman and CEO of IBM. I, also, was part of that initiative.

Other organizations undertook similar studies and reached similar conclusions, including the National Academies’ Rising Above the Gathering Storm report. I, also, was part of that initiative.

Together, these reports propelled the 2007 America Competes Act — which laid out basic action steps, but which is not fully funded.

These initiatives identified as key necessary elements of an innovation ecosystem: talent, investment, infrastructure. How might this play out?

An innovation ecosystem, requires an innovation infrastructure built upon rejuvenated university/government/industry partnerships — a revamped “Vannevar Bush” model, if you will — which combines Federal investment in basic and some applied research, corporate support for research and development, and human capital development.

It means focusing research and technological development at the nexus of key challenges and intersecting vulnerabilities, such as the nexus of energy security and climate change,

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or the nexus of energy and water, and ultimately the nexus of all three — energy/climate change/water.

It means exploiting advances in new fields to lessen the energy intensity of existing energy sources, and to develop new ones — advances in such fields as nanotechnology, computational science and engineering (or computation and information technology), and even biotechnology.

To do that requires cross-sector, multi-disciplinary approaches that even go beyond just science and technology — to explore the intersection of science, technology, and public policy. An example: technological modeling of grid operation against policy decision-making and economics, that could lead to decisions about what kinds of power plants and transmission equipment should be built, and where.

This includes support for the technological infrastructure necessary to connect less carbon-intensive, more intermittent, energy sources to national power transmission and energy transport systems. This requires, for example, monitoring and new, real-time control technologies that are responsive to shifting loads and inputs to the electrical grid, but that, also, increase grid robustness and reliability.

Fundamentally, we must understand that innovation means more than technological innovation. The United States has all the basic innovation advantages. We have a highly sophisticated educational system; a well-developed science infrastructure; a financial system that, heretofore, has provided ready access to capital; a long tradition of investment in entrepreneurial projects, supported by government policies that have encouraged investment and entrepreneurship; and government structures designed to support and invest in the scientific enterprise. We have a history and tradition of public/private sector collaboration; a thriving, diverse culture of risk-takers where ideas are welcomed and viewpoints sought; a long history of taking great risks for great rewards. These advantages, however, are locked up — at the moment — because of the crisis in the financial sector, and the global recession. It is critical to restore confidence in financial markets to unleash these fundamental innovation elements once again.

Even with the appropriate innovation infrastructure, the capacity to innovate rests solely upon a well-educated workforce. We must have talent, talent, talent.

Managing talent in a severe economic downturn calls for creative thinking.

Within the private sector, some suggest careful culling of the lowest 10 percent of performers — identifying which workers to keep, and retraining others — rather than the more blunt “last-hired/first-fired” approach. Similarly, voluntary reductions should be avoided in order to keep the best talent, and — underscoring Mr. Immelt’s point — managers should continue to hire scarce talent when it is available, even through the recession — especially in the energy arena.

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Universities are a key component of the innovation ecosystem, because they educate the workforce of the future — particularly in science and engineering. But universities must meet students where they are, getting them engaged in research, and multidisciplinary teams, working on the important problems of the day, and encouraging them to exploit their creativity not only in the commercial realm, but, also, through social entrepreneurship.

- Rensselaer Polytechnic Institute supports this, directly, through an endowed “Change the World” challenge that awards innovation — endowed by an alumnus who, himself, moved from engineering, to entrepreneurship, to filmmaking, to humanitarian efforts.
- Another prize — the Lemelson-Rensselaer student prize — annually awards innovation by a student who has created or improved a product or process, applied a technology in a new way, redesigned a system, or in other ways demonstrated remarkable inventiveness.
- These, and other efforts, go a long way toward giving young people, not only the skills, but the outlook, to tackle complex challenges.

The government has a somewhat different role to play. It should focus on skills training of workers for new enterprises, financial incentives for workers in transition, financial support for university-level students, and support for basic research in universities.

Many corporate executives and national studies have decried the lack of U.S. national investment in research, and in teaching young people mathematics and science.

Many, also, agree that talent and ideas know no boundaries — that talent can and should be accessed globally, and that it is important to commercialize, and to diffuse and use inventions through business innovation — whatever their origin.

Because talent and innovation are global, some corporations, especially multinationals, have created global research networks to tap talent, ideas, and markets — globally.

Nonetheless, most, also, agree that in order to increase the technological sophistication of workers, and to support the overall development of human capital, it is important to develop indigenous talent, and to attract international talent — in order to create the intellectual cauldron from which innovation really springs.

In the U.S., our vital, valuable science and engineering workforce is threatened because our current cohort of scientists and engineers are retiring, and we are no longer producing sufficient numbers of new graduates to replace them. Although we continue to attract talented international scientists, engineers, and students, we are in an increasingly fierce global competition for this talent. We do not hold on to them, as much as we did in the past, because other nations now have more educational and career opportunities for talented scientists and engineers — from everywhere.

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Our own demographics have shifted. Our “new majority” now comprises young women and racial and ethnic groups traditionally underrepresented in advanced science and engineering schools. This is what I have called the “Quiet Crisis:” — “quiet” because it unfolds so gradually — a “crisis” because a human capital deficit can hinder our national, even international, innovation capacity. If we are to develop indigenous talent, we, also, must develop and tap this resource.

The triple-linked threat of energy security, global climate change, and economic crisis creates the imperative to bolster our innovation ecosystem — with talent, investment and infrastructure. This is more urgent, now, than ever.

Thank you.