Ecosystems for INNOVATION

An interview with U.S. CTO Aneesh Chopra

INTERVIEW BY VIKRAM MAHIDHAR > PHOTOGRAPHY BY MATT LENNERT

The fast-moving frontier of new technologies and business models is challenging traditional models of innovation.

Historically, larger companies, universities or government agencies with deep pockets have often brought forth the ideas that shape business and society. More recently, though, the advent of new digital infrastructures such as cloud computing, mobile and online social networks is enabling small groups of individuals with small investments to create big impact.

The economic importance of innovation has emerged as a central theme among governments, especially with many parts of the world economy still on a shaky footing. New ideas spawn new industries and can enhance a country's economic position. One of the better investments a government can make, some argue, is in building blocks that enable and encourage short-turnaround, fast-paced innovation.

Among the prominent figures in the innovation space is Aneesh Chopra, the United States chief technology officer. In this role Chopra serves as an assistant to the president and associate director for technology within the Office of Science & Technology Policy. He works to advance the president's technology agenda by fostering new ideas and encouraging governmentwide coordination to help the country meet its goals, from job creation to reducing health care costs to protecting the homeland.

VIKRAM MAHIDHAR: WHAT TRENDS DO YOU SEE IMPACTING INNOVATION, AND HOW?

ANEESH CHOPRA: Three trends are significantly lowering the cost and accelerating the speed of innovation.

The first trend, the digital infrastructure, is now demonstrating benefits to the entrepreneurial ecosystem in ways that might have happened in the past but at a much faster rate with much broader impact. The advent of broadband networks has really democratized access to computing power and as a result has made the business case around cloud computing more realistic. It is not just broadband, but combinations of infrastructure enhancements – including processing speed and computing power. We now have a truly agile infrastructure that offers a greater degree of personalization.

The second trend is mobility. The U.S. president has made wireless a major part of our infrastructure story for the 21st century. We are describing it as the third wave of economic growth in the Internet, the first being dial-up, then broadband, now mobile broadband.

The third trend that is emerging is open innovation, broadly speaking. The greater reliance on interoperability standards now offers a wide variety of choices across a spectrum of price points to perform the same task. Similarly, for businesses to be successful there isn't a need to offer a complete portfolio of applications as used to be the case.

So as a result the net bottom line is that the cost to innovate, at least in the IT domain, has been dramatically lowered. It's not exactly the same story in pharmaceuticals, nor is it the same story in clean energy – those remain capital-intensive segments of our innovation infrastructure. But on the IT component these are the trends that we're finding.

VM: ARE CAPITAL-INTENSIVE INDUSTRIES SUCH AS LIFE SCIENCES OR ENERGY ABLE TO BENEFIT FROM NEW INNOVATION MODELS DRIVEN BY DIGITAL INFRASTRUCTURE? OR IS IT JUST LIMITED TO THE IT COMPANIES?

AC: One of the recent studies on global competitiveness found that, in the U.S., industries like health care, energy, education and obviously government as a services industry itself have not seen the kind of productivity gains that retailing and other sectors have from the innovations of the digital era. Much of the work I've done in the Obama administration is to think about how the principles of innovation from the IT arena actually can transform industries that have not seen these productivity gains. So we are particularly focusing on smart grid technology; that is how IT innovation will help improve energy efficiency. In addition we are also emphasizing educational services as well as health care services. In fact the president just announced our strategy for educational transformation through innovation, and we will soon be unveiling a strategy for smart grid.

VM: WHAT IS YOUR FAVORITE EXAMPLE OF A NEW INNOVATION MODEL DRIVEN BY THE DIGITAL INFRASTRUCTURE IN INDUSTRIES OTHER THAN IT?

AC: My favorite by far is in health care. A year ago, our health and human services department awarded a research and development grant to a team at Harvard University led by professors Zak Kohane and Ken Mandl to develop an app store for health care.

Within a year they developed an open-source architecture called "Substitutable Medical Applications, reusable technologies," or SMArt. This architecture provides a set of core services to facilitate substitutable health care applications, or plug-ins, similar to the App Store found in the iPad, iTouch or Droid.

Today it is hard to find a provider that has digitized its health information. We have not seen the kind of competitive marketplace where new startups or small firms could come in and build valuable applications on top of the health care infrastructure. It is too expensive to do that because most health care providers use their own proprietary standards and applications.

This Harvard team was tasked to liberate health data in a standardized way such that the vendors can have common standards to build third-party applications capable of running on multiple platforms at low to no marginal cost.

Within a year this team published its first application programming interface, and it has initiated a $5000 prize for the most innovative app developer who can build value off of those data to improve quality and lower costs in health care. It's the first organized third-party application ecosystem on top of our traditional IT architecture in hospitals and doctors' offices. This is an example of a tangible good that has come out of this new innovation model, and I believe that we'll be impressed with the kind of breakthroughs that will come out of this movement. You can learn more about this at smartplatforms.org.

VM: THIS NEW INNOVATION MODEL INVOLVES VARIOUS DIMENSIONS – CROWDSOURCING, OPEN STANDARDS, OPEN PLATFORMS AND R&D PERFORMED BY THE EXPERTS. HOW WOULD YOU DEFINE THIS INNOVATION MODEL?

AC: Well, I don't have a good term for it. The default is to call it open innovation. Open innovation is probably defined by a number of people, not the least of whom is Henry Chesbrough. But what I can speak to is the role of government in this endeavor. I believe that in the technology and innovation domain, the government's untapped potential is to serve as convener. We have historically made investments in research and development, and that continues to be a high priority for the Obama administration. We are always thinking about infrastructure investments such as wireless, broadband and

the like. But what's less explored as an innovation model is coming together as a community to create solutions through applied R&D with government's role as a convener.

I saw this firsthand in health care information exchange. We had a physician publicly testify, lamenting the fact that he was not able to use what you and I might refer to as simple, basic email infrastructure to transmit his patients' medical data from one doctor to the next. While we had been thinking about health information exchange writ large, often in the most complicated ways where there are a lot of trust and security issues that have to be worked out, this question was much simpler. That is, if I'm a physician and I would like to proactively send information to a colleague, I could today fax it to you, but I can't email it because of concerns on security.

In the role of government as convener we simply challenged the industry to develop technical specifications for safe, secure email, and we asked them to deliver results in 90 days – knowing that we weren't trying to invent nuclear physics, we were simply trying to take existing tools and templates that have been used in other sectors of the economy, but to bring them in a consensus manner to health care. Over 80 companies participated; the government hired a project manager and set up a website at directproject.org, basically a wiki. And 90 days later, the group achieved consensus on a version of SMTP that allowed for safe, secure email. And 90 days following that agreement a reference application had been developed collaboratively. Then the private sector in a very competitive market agreed to commercialize that work and to compete.

Now over 50 organizations have committed to implementing the specifications, and the going price is about 15 bucks a month for unlimited safe, secure email. I believe in a competitive marketplace this price will only go down, not up. And it's a service that did not exist in nature a year ago. Now, did we have to invent anything new? Not really. We had to agree on

a business model around technical standards. But we largely gathered existing tools and put them to use. So it's convening in the sense of identifying a challenging problem and collaborating with the American people to solve it.

It is opening up new markets for the private sector for commercial opportunities. Note that it's not open source where everything has to happen for free. There is a business model here, and people can make money – 15 bucks a month for unlimited safe, secure email. And let people compete on how the customer experience is. From the doctor's perspective, the hospital's, let the price point fall or rise as the market decides. So that's open innovation plus government as convener, unlocking growth markets in areas that have historically not seen the productivity gains we would have otherwise liked. And that, in our humble opinion, is an important factor in our long-term economic prospect.

VM: IS OPEN INNOVATION AS YOU HAVE DESCRIBED IT HERE CAPABLE OF DELIVERING DISRUPTIVE INNOVATION?

AC: We are certainly seeing early examples of disruptive innovation. In addition to extending value of the existing platforms very fast, such as creating that secure email platform within 90 days, government is also investing to deliver truly groundbreaking ideas in a variety of sectors including clean energy, health care, education and others. The president has signed the America Competes Act, which has given federal agencies the authority to run challenges and competitions engaging the rest of the world to address challenges and come up with breakthroughs for a prize. This approach primarily focuses on the applied side of R&D where the emphasis is on developing applications around groundbreaking fundamental innovation. It can be effective because you're buying results, as opposed to funding promising approaches. And you have a higher probability of supporting disruption because you're leveraging all of the R&D efforts that would take place outside of your four walls.

The most active government agency in this regard is ARPA-E, Advanced Research Project Agency - Energy. For example, the ARPA-E program has identified a number of disruptive challenges in domains such as energy storage, transmission of energy, conversion of plants or cellulosic capabilities into energy and others. In each of the domains ARPA-E has put out resources against teams that have demonstrated a proof of concept around breakthrough fundamental R&D.

One of the challenges that they have posed to the world is, for example, can we create batteries for cars that cost 80 percent less and achieve twice the longevity of today's lithium ion batteries? Such performance-driven, outcomes-driven models are very much part of our innovation strategy. The most recent challenge we recently completed was the $10 million X Prize for automobiles that could achieve 100 miles per gallon. A team in Lynchburg, Virginia, that does not produce cars today, was successful in building and demonstrating a car that can achieve 100 miles per gallon with innovations in low weight materials for vehicles plus efficiencies with the energy consumption. We may not have come across this team if it was not for this challenge.

The president announced recently that we want to have an ARPA-Ed for education, and then our Centers for Medicare and Medicaid Services to deliver the same breakthroughs in Medicare payment systems. All of these models share the following attributes: opportunities to surface breakthrough ideas; to prototype or demonstrate their effectiveness – evidence-base, if you will; and then to create a pathway to scale what works. And that is a lot of where our innovation strategy has been and continues to thrive.

VM: HOW DO YOU SEE NEW MODELS OF INNOVATION WORKING TOGETHER WITH TRADITIONAL INNOVATION MODELS?

AC: They all have to be part of the portfolio. We spend $147 billion a year in research and development in the federal government. My presumption is the overwhelming share of that money is

in the traditional approach, which goes in fundamental research at the university level or at federal labs, resulting in ideas demonstrating an opportunity for commercialization. The private sector taps into these labs to commercialize such ideas, and the value is created. For example, the battery in the Chevy Volt includes intellectual property derived from research at one of our federal labs, Argon National Laboratory, from over 10 years ago. So the traditional model of planting your seed corn and looking out 10 years does in fact deliver results for the American people. It did so in DARPA's investments on the Internet. Even the work at Google got a boost from an early grant on libraries. So I think the traditional model has been the bread and butter for our R& D pipeline.

But as we look from our basic innovation ecosystem investments, through the National Science Foundation and the like, to some of the new applied R&D initiatives that are aligned to mission objectives, the new innovation model mostly is how we can achieve breakthroughs in the mission priorities through applied R&D.

VM: HOW DO YOU SEE GOVERNMENT ITSELF ADOPTING THE NEW MODELS TO IMPROVE ITS INTERNAL PRACTICES?

AC: That was my first homework assignment as I took this job. President Obama, on his first full day in office, issued a Presidential Memorandum on Open Government that directed the then unnamed Chief Technology Officer to provide advice on how to make government more open. And the president specifically spoke of harnessing the power of transparency, participation and collaboration as guiding principles for how we would like to run the government.

We focused a great deal of our time and attention early in the administration articulating that vision and challenging our federal agencies to personalize that mission and vision through their domains. Every federal agency today has articulated that vision by preparing its open government strategy.

For example, you can read the open government strategy for Health and Human Services at hhs.gov/open. Every cabinet-level agency fulfilled that objective, all within the first year or so following my arrival.

As the culture starts to incorporate these changes, the value now is to take advantage of the open government approaches, combined with three policy levers—the role of R&D collaboration, the role of open data, and the role of voluntary industry consensus standards activities—along with the new models for public engagement to deliver breakthroughs.

That's the formula we've adopted in the administration, and we're hopeful [it] will be a lasting legacy for the public sector regardless of party or who holds the executive office.

VM: WHAT TYPE OF TALENT IS REQUIRED TO MAKE THIS HAPPEN? IS IT DIFFERENT THAN THE EXISTING TALENT THAT FOCUSES ON THE TRADITIONAL R& D?

AC: It starts with entrepreneurs. We have recruited a network of entrepreneurs in government such as the Chief Technology Officer at HHS, Todd Park, who founded Athena Health, a publicly traded company. Another example is the Chief Technology Officer at Veteran Affairs, Peter Levin, who founded a number of cybersecurity companies and had a number of economic successes. These entrepreneurs have come to Washington to take these principles and hardwire them into their respective cultures.

It starts with the president setting the tone and challenging us. It's then the cabinet secretaries accepting the challenge and turning to these entrepreneurs in most agencies to achieve results. Then the most important part, staffing such initiatives with people who have the entrepreneurial skills and passion for such work but had not known that they would have the support from the top to experiment and in some cases, dare I say, fail.

Knowing there's a chance to experiment, within an appropriate risk management framework, we're finding the best staff people for these entrepreneurial ventures are our longstanding and talented professionals who know the subject matter better than anybody, have been keenly interested in ideas like this, but were looking for someone to champion their cause and encourage them to pursue this type of work.

It is really a combination of two things – tapping into the latent power of the agency infrastructure and entrepreneurial culture – that rewards the kind of innovation we're describing.

VM: HOW DO YOU MEASURE SUCCESS? ARE THE GOALS AND CRITERIA SIMILAR TO MORE TRADITIONAL APPROACHES?

AC: The interesting thing about the metrics is that they are first principles that we had almost forgotten about. For instance, if you were to ask someone, "What does HHS do?" most people would say it provides health insurance to the elderly and the poor and the disabled, because everyone mostly knows of HHS in the context of its role as Medicare or Medicaid provider. But what they don't remember is that the actual mission statement of HHS is to improve the health performance of the country, community by community.

Similarly if you go back to the first principles and ask what can we do to harness the power of technology, data and innovation to achieve the fundamental mission objective, that hasn't changed, but it is allowing us a new look because of these advances in IT.

The new model is to unleash data and empower people to take control over their own community's destiny through delivery on four key attributes – inspire, cajole, nudge and convene. These attributes achieve the base mission objective even if they're not aligned to a specific funding appropriation or a given program that's been authorized in the budget. These are things that were always available for folks to do but had not been the priority that we're making it.

VM: YOU TALKED ABOUT ALLOWING PEOPLE AND PROGRAMS TO TAKE RISKS AND GIVING THEM ROOM FOR FAILURE. HOW DO YOU DESIGN THAT?

AC: It's a lot easier to plan for failure within the current legislative authorities. The examples that I gave earlier—ARPA-E, ARPA-Ed, DARPA—the legislative authorities of these federal agencies allow them to govern their risk portfolios. They are allowed to invest in breakthrough ideas that will take 10-years-plus to mature. Or to invest in programs that may or may not deliver results, programs that showed promise but didn't demonstrate success on the backend.

Where government funds are not involved upfront, the role of government as convener makes it a lot easier to manage risk because you're not bearing the financial burden of wasting taxpayer dollars. You are paying for results. For challenges and competitions, what you actually have is the most highly productive asset base because you're paying for the winning idea with results as opposed to paying for attempts or shots on goal. It's a lot of the performance-driven management philosophy the president has adopted through his chief performance officer, my colleague Jeffrey Zients.

VM: WHAT CHALLENGES DO YOU SEE AROUND OPEN INNOVATION?

AC: The biggest challenge is whether or not the ecosystem will embrace this approach. For instance, in the case of the health information exchange example, our desire to bring the health care stakeholders together to help design the standards that opened up safe, secure email happened to fit almost like a glove with where the industry intended to go anyway. It just didn't have the convening and the nudging to get it done. So the timing worked very well. Will the same opportunities present themselves in energy, in education, and even in other domains of health care where we need to see breakthroughs?

Second is how the policy objectives and the ecosystem as currently organized might allow collaboration. In open innovation you're reliant on partners that aren't required by law to do anything, but you're hopeful there is a coalition to be formed in the organizing. So the science around organizing and celebrating and nurturing the ecosystem is not something traditionally known in public service, and it keeps me up at night.

Third is our ability to communicate the value – that is, to demonstrate meaningful and tangible results to the American people. I am accountable to my president; we are accountable through Congress and to the American people. We need to demonstrate that these ideas are delivering value for the American people relative to the investment that we're making as a society in these issues. And I must constantly assess the degree to which these initiatives will deliver results or not. I need to make sure I'm advising the president with the best information that we have on which of these initiatives to move forward on and how and in what manner. I've got to make sure the right cost-benefit equation is understood when moving forward.

VM: WHAT CAN THE PRIVATE SECTOR LEARN FROM HOW YOU ARE APPROACHING INNOVATION IN GOVERNMENT?

AC: For the private sector to adopt this "ecosystem" innovation model there are clearly issues in pre-competitive collaborative space that I believe have room for further evaluation and consideration.

Back in the days of Bell Labs, there was a forcing function, a natural magnet that convened the ecosystem. Professors, small businesses, supply chain vendors, etc. came together around common challenges. It offered an opportunity for everyone to collaborate and win together. In the absence of some of those traditional corporate labs we've lost some of that convening power.

I think one of the opportunities for industry is to start thinking anew about how might we come together and collaborate more without violating concerns of antitrust or other regulatory barriers. I believe there's a chance to see more of this collaboration and in fact could be encouraged by this notion of government as convener. I think the message to the private sector is to start thinking about how we might, together in a pre-competitive context, think anew about research and development needs. Think anew about data that's held by government that if released could help inform new products and services. To think anew about industry-driven consensus standards activities that would open up and unlock opportunities that today are much more difficult. I think the private sector would be in a very strong position to engage Washington, to think of those opportunities, and we're ready and waiting to do it. DR

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