20 Government and Private Sector Roles in the IT Revolution

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Whether one is directly involved in the information technology (IT) industry or simply dependent on its products, we are caught up in an information revolution that is transforming society at large. At the heart of this revolution is the vision of a society exploiting information technologies to connect people with business, with government, with information of all sorts, and—perhaps most important—with each other.

I would like to offer some reflections on government's role in this revolution vis-à-vis the private sector as well as the academic and research sectors. The revolution is evident in the frenzy of connectivity all around us. One IT consultant estimates that 200 million people worldwide will be connected to the World Wide Web in 1999, and a half-billion by 2003. More than 200 million devices—everything from set-top boxes to screen phones—will be connected by the end of this year, and almost three-quarters of a billion devices will be connected by 2003.

Consumers are spending ever more billions of dollars via the Web, while estimates of worldwide business-to-business Internet revenues for 2003 exceed $1 trillion. Meanwhile, companies are reducing paperwork, cutting costs, and saving hundreds of millions of dollars just by sharing information with key suppliers and employees. My own company sold more than $3 billion worth of goods and services online last year, and its current electronic commerce volumes are running at roughly $1 billion per month.

It is not just business, either. Education, health care, research, government—practically all of society's institutions are using the Internet

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to empower students, teachers, patients, citizens, and constituents. Even the IRS has enabled millions of Americans to file their tax returns over the Internet, once again reaffirming T. S. Eliot's observation that "April is the cruelest month." But despite all its momentum, our revolution is not a spontaneous phenomenon. Connecting the whole country, the hemisphere, and even the world is hard, deliberate work.

The wholesale transformation that our revolution envisions is easily among the more ambitious enterprises our country has undertaken. The Manhattan Project, the Apollo landings, and the Strategic Defense Initiative seem simple compared with the complex scientific and social changes involved in connecting and transforming all of society.

Such a monumental task requires that the major participants in the revolution—the university and research communities, private industry, and especially government—be partners in pursuit of the vision. Together, we are trying to build something both very complex and very wonderful.

Our guiding principle must be pragmatism. We must be true to that brilliant depiction of Americans as a "nation of tinkerers"—a people focused intensely on what works. That focus on the workable must inform all our efforts, but especially the policies and practices of government.

Government must encourage and promote the revolution and at the same time beware of ill-advised laws or regulations that can distort the marketplace, divert vital resources, or deflect the course of some promising research project. Our information society has the feel of a very complex, mysterious, and exciting ecosystem in which each element is connected to and influences every other element, and ultimately the life of the whole.

The government's role of enabling that ecosystem to grow and flourish is akin to that of a very wise gardener. The garden needs to be tended, the soil cultivated and fertilized as necessary, and the proper seeds planted. The garden then needs a watchful eye to make sure that weeds and pests are properly dispatched. But beyond that, the gardener must be pragmatic and be content simply to let the garden grow, and let all its various parts achieve their natural balance and productivity in the ecosystem. The right relationship has to exist between the gardener and the garden. One does the tending, the other the growing.

This is the kind of pragmatic posture we on the President's IT Advisory Committee took when we outlined the areas essential to establishing the information age in the United States. If you have read our report, you know we called for a substantial increase in IT research and for close

attention to the major social issues that would accompany the transformation of our society to the information age.

Government has a role to play in just about every aspect of the transformation—sometimes a more prominent role, sometimes less. Take research, for example. Everyone agrees that long-term, strategic research is essential to the future health of the IT industry and to all the other businesses and the millions of people in the United States who depend on it directly or indirectly. The real issue is the division of labor: What roles should government, academia, the research community, and industry play? The most instructive example might be the Internet itself.

More than a quarter-century ago, you could not find a business in the United States with an interest in linking four universities' host computers together. The U.S. government, on the other hand, had a compelling interest in establishing a system of communication that would withstand a nuclear attack. DARPA went ahead with the project, and so the Internet was born.

Over time, researchers at the national labs and universities connected and began sharing information and applications. And most important, they began enhancing existing technologies and standards and developing new ones.

Today, according to some estimates, that modest original Internet has grown from four hosts to more than 40 million. It connects roughly 180,000 networks and supports well over four million World Wide Web sites. The real spurt stared five or six years ago when businesses began to realize that, through the Internet, they could connect all their islands of automation internally, and reach out to millions of existing and prospective customers all over the world. And as all the new Internet companies have demonstrated, you did not need the resources of a Fortune 500 company to accomplish it.

In building the original Internet and extensions like the NSFNet, government responded to a need that no one in the private sector had any incentive to satisfy. Government seeded the initial efforts and continued to nurture it over time. Universities and researchers developed it further. Now the business community is transferring its commercially useful fruits to the marketplace.

That is precisely the model of the right relationship between government, academia, research, and industry as we continue to move our nation into the information age. The IT industry is fully prepared to invest in research and development, but in this most competitive marketplace in the world, the lion's share of those funds must flow toward

product development—and most of what remains flows toward company-specific, near-term applied research.

Only a small number of companies can afford to invest in research with a five- or ten-year payoff. The vast majority of companies do no long-term research. IBM is the exception in our industry, not the rule. Thus, there is a widening gap between the growing numbers of IT applications and users in the marketplace—the demand, so to speak—and the fundamental research that has traditionally supplied the underpinnings—the seed, as it were—for IT technologies, infrastructures, and applications.

So if high-risk, long-term IT research is to be done, the university and research communities—funded by the government—must do it. That is the only way to maintain our nation's competitive advantage, ensure the prospect of long-term economic growth, and in the process train a new generation of researchers to preserve and extend our technological primacy.

Beyond long-term research, government can hasten the coming of the information age by showcasing the new, complex technologies that underlie its own applications. The Department of Defense has done this through the years—the Internet being a case in point. The Accelerated Strategic Computing Initiative (ASCI) program is another example of government—in this case, the Department of Energy—leading the design of very powerful parallel supercomputers for its own applications.

Certainly the government is working to leverage the potential of IT, but to date it lags behind the American business community. That is not surprising. At IBM we learned that such transformations are tough and take time.

Organizations resist change. A concerted effort is needed to master all the technical challenges, and to break through the even tougher cultural barriers. The Department of Defense, for example, is beginning to face this era of transformational change in its approach to warfare. It is shifting from the traditional model of warfare based on platforms like tanks, ships, and planes to a network-based warfare that can potentially deliver to the U.S. military the same efficiency, responsiveness, and innovation it has brought to American business. The intelligence community, too, is trying to create a more networked, collaborative, environment among its major agencies and mission partners to provide a richer, more comprehensive intelligence picture to the warrior.

Beyond those agencies, which are usually found in the vanguard of new technologies, are the sweeping, inclusive nature of Internet-based

applications and the variety of government agencies that can help build them. The Department of Health and Human Services, for example, should lead in telemedicine. Distributed learning technologies are absolutely indispensable for the Office of Personnel Management. Security and authentication technologies are absolutely indispensable for the Social Security Administration and the IRS. In many of these areas, management tools can make substantial contributions in data handling as well.

While it is clear to all of us on the President's advisory committee that government has the preponderant role to play in long-term strategic research, it is equally clear that the profound transformations arising from the information revolution are raising very important societal issues—issues like access, learning, and privacy. Government's interest in each is very real. How it should act in each case varies. With technology prices plummeting, the marketplace itself will provide near-universal access over time.

So, government should probably adopt a more subtle role, restricting itself to indirect actions like continued deregulation and offering access at government facilities or kiosks in public spaces. Research on new wireless technologies will also significantly help in providing high bandwidth connectivity for everyone. When it comes to education and learning, on the other hand, government at all levels should unquestionably take a strong leadership role—implementing policies that raise educational achievement across the board and that prepare our society for lifetime learning.

But of all the byproducts of the IT revolution, the growing concern for privacy is among the more critical. How well we protect personal information online will determine whether the Internet will achieve the success we all hope for. Privacy is not a cut and dried issue. What is and is not private changes from person to person. For one person the scope of privacy is very narrow; for another, it is very broad. For some people privacy is negotiable, and they may be willing to trade information about themselves in return for something of value.

Ask the average person how to assure personal privacy online and you will probably get a reflexive resort to government control. Certainly a pervasive regulatory regime could assure the public that nothing improper would happen to their personal information by making sure that nothing at all would happen to their personal information—nothing bad, certainly, but nothing good either. At the other extreme is the laissez-

faire solution, which might suffice in a perfect world. But, as the Founding Fathers knew, human nature is far from perfect.

So, somewhere between those two poles lies the answer—some balance between legitimate government action and the rewards and sanctions of the marketplace. Frankly, I am inclined to find the balance much closer to the marketplace. After all, when the economy is networked, global, and competitive, consumers can impose sanctions and punish a company much faster and more effectively than can government.

But of all the participants in the networked economy, members of the business community especially need to establish themselves as worthy stewards of privacy. That is one reason IBM announced recently that we would advise only at Web sites that posted their privacy policies.

The great majority of the business community recognizes that its real interest lies in maintaining the trust and confidence of their customers—and therefore in respecting the privacy of personal information. That is why any government privacy policy should provide maximum latitude for stringent self-regulation—the kind of discipline that business is already adopting.

The 80 global companies and major trade groups of the Online Privacy Alliance, for example, have created guidelines for privacy policies and an enforcement framework with real teeth. Many Alliance companies are working with "seal programs"—independent third parties like the Better Business Bureau's BBBOnLine, and TRUSTe—that monitor a company's compliance with its privacy policy and confer, as it were, a seal of approval.

Industry has made real progress. According to one observer, when someone visits a Web site this month, there is a 90 percent chance that it will be operating under the guidelines of the Online Privacy Alliance. And beyond government and in industry is the individual empowered by increasingly sophisticated software tools.

Clearly, the less government obtrudes on the marketplace, the greater will be the flow of Web transactions delivering goods and services, health care, government services, financial services—indeed, everything that is dependent on online trust. And flowing from that will be new opportunities, new business, and new jobs in all sectors of the economy.

In the history of our country, few partnerships have been more fruitful than the collaboration between government, academia, the research community, and the IT industry. It has made us the world's unquestioned leader in information technology and the pioneers of the information age. Certainly, government played a leadership role throughout the

process; and in some cases, leadership meant playing the dominant role as it did in starting the Internet. In other cases, the role has been less direct—such as seeding and cultivating research in the universities or collaborating with industry through the national labs.

As government defines its proper role vis-à-vis industry, the universities, the research community and the IT industry, it must constantly ask: "What will work best?" Unless we are talking about truly long-term, strategic research, what will work best are policies that permit each part of the ecosystem to pursue its natural course—the free intellectual ferment of the university and research communities, for example, and the creative chaos of the marketplace.

The really hard work for the gardener is in the beginning. After that it is up to the garden and the elements.