

OVERTAKEN
on the Information Superhighway

How the U.S. Lost Internet Leadership
and What to Do About It

Thomas Bleha

Dedicated to the memory of my parents:

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and

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“Second only to a weapon of mass destruction detonating in an American city, we can think of nothing more dangerous than a failure to manage properly science, technology, and education for the common good over the next quarter century.”

– U.S. Commission on National
Security/21st Century (2001)

“Technology shapes possibility in the long run, but politics determines results in the short run.”

– Former FCC chairman
Reed Hundt

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Chapter 1.

A look ahead – to 2015

Consider these two scenarios set in 2015.

Hiroshi Saito, an old friend and engineering professor at Keio University in Japan, had agreed to bring me up to date on Japan's Internet progress in the decade since 2005. So we met to talk at the elegant, mahogany-paneled coffee shop *Inoshishi*, in Yokohama, just west of Tokyo, on October 25, 2015.

Saito-*san* began by saying Japan had advanced greatly during the past decade. Now nearly all Japanese could access “ubiquitous networks,” completely integrated, ultra-fast, fiber broadband and wireless networks that are 70 to 700 times faster than American broadband was in 2005. Three-quarters of the Japanese were now using these networks. And to access them, most had become heavily dependent on fourth-generation mobile phones introduced in 2012. Now called Personal Communications Devices (PCDs), these handsets were used for just about everything: cash, subway and train tickets, identification, keys, scheduling, controlling home appliances, listening to music, watching movies, reading books, navigating streets, and in many other ways. Best of all, we Japanese now simply speak to our PCDs and

computers to control them. “But rather than just talk about all that,” Saito-san said, “let me tell you some of the things my family did yesterday....”

“Early in the morning, my PCD warned me of an accident on the road I usually take to the university. The PCD also gave me train schedules, but I decided to drive a short distance along my usual route and then detour around the accident – using my PCD as my car’s global positioning system. That worked, and I arrived in plenty of time to teach my class.

“I do some consulting as well, and yesterday afternoon, a client called from Sapporo, a city about 500 miles away. I was out running errands at the time, so I held a videoconference with my client using my portable 20 x 25 centimeter (8” x 10”) tablet-screen that connects wirelessly to my PCD. I was not only able to see my client, I could also observe his body language and facial expressions – and I resolved his problem. Ten years ago, I would have had to take a bullet train to Sapporo – over three hours each way.

“Last night I sat down with a beer to watch some *Sumo* [Japanese wrestling] matches from the 1980s that I told my PCD to download that afternoon. We can now watch thousands of sports events, movies, and TV programs, or photos, calligraphy, and movies we create ourselves wherever we want to.”

Assured that I wanted to hear more, Saito-san continued: “Yesterday morning, my wife, Kazue, who was at home in Yokohama, had a four-way video consultation with her mother, who has heart trouble, and her mother’s doctor, who were about 100 miles away in Kanazawa on the Japan Sea,

as well as a heart specialist in Tokyo. All of mother’s medical records, including MRIs, are online, so the doctors could easily review them. After some discussion, they decided the best course would be to monitor mother’s vital signs around the clock with sensors that connect to her doctor’s information center. If her vital signs reach dangerous levels, her doctor’s PCD will alert him. If her condition becomes worse, we can have all of her activities monitored at home with an array of sensors. That kind of medical attention is a great comfort to us because mother is now 88, and we live so far away.

“Except for one day a month when she must go to her Tokyo workplace, Kazue now telecommutes. She calls or videos her supervisor or colleagues on their PCDs whenever she needs to, and she participates in virtual office meetings with video-conferencing from home or with her PCD tablet-screen elsewhere. Nearly half of Japan’s workers telecommute these days, and many of us will move to the country as soon as our children finish high school.

“At home, we can control heating, air conditioning, and almost any appliance with our PCDs from wherever we are. We can also track our food. When Kazue passes her PCD over a bar code next to fish at the supermarket, she receives instant information on her PCD screen about when and where the fish were caught and when they reached the store. She can also learn whether pesticides were used on fruits and vegetables and how fresh they are. When she’s made her choices, she pays with her PCD linked to a credit card. We seldom use cash any more.

“Our daughter, Hiroko, who’s in high school, is obsessed with Korean pop singers. She’s so involved that she’s now taking a Korean-language course three times a week by video link with a language school in Seoul. She’s also taking an online weekly video class in popular-song writing and music-video production from a young Japanese woman who studied at a music school in Boston. Now Hiroko is creating her own music videos and putting them on her website.

“As you can see,” Saito-san concluded, “the way we live has changed dramatically over the past decade. And all of this innovation has meant a big boost for our economy and many new jobs.”

Two weeks after talking with Saito-san, I asked Joan Nelson, a computer-science professor at George Washington University in Washington, D.C., to chat with me about the Internet’s role in American life in 2015. She agreed, and we met at a Starbucks coffee shop on Pennsylvania Avenue.

Joan began by saying, “The U.S. government never did develop a plan to promote high-speed broadband or the wireless infrastructure. But, as you know, gradually increasing competition between the cable and telephone companies led to substantial progress. Fiber-optic cable now reaches half of American families, and one-third subscribe to fiber service that is 15 to 30 times faster than the average Internet connection was in 2005. High-speed, fourth-generation mobile phones were introduced last year, and 250,000 Americans in about twenty cities are now using them. And nearly 20% of the people with mobile phones subscribe to wireless Internet access for news, streaming video, and entertainment.

Unfortunately, the wireless infrastructure is still far from complete, so some calls still won’t go through or are dropped. And, unfortunately, most Americans are still tied to their laptops – and their keyboards – for most things.

How far have we really come?, I asked. Joan replied, “Although we live in northern Virginia, not far from the self-proclaimed Internet capital of the world, we can only get cable Internet – about 20 times faster than our 2005 broadband Internet connection. That’s because most of the houses in our area are on large lots, and it’s expensive to bring in fiber. So for most of my work, I have to go to my office in Washington – ten miles away – to use the university’s fast, fiber Internet connections. For example, I’m now participating in an online MIT project, and I have to use my university computer to work with the three-dimensional displays.

“My consulting practice is easier than it used to be. I can videoconference with some of my larger clients, and that has cut my travel in half. But my smaller clients usually don’t have fast Internet connections. So they have to use an expensive commercial videoconferencing studio if one exists nearby, or I have to travel to them. Usually I travel.

“As the computer scientist in the family, I’m in charge of our home’s heating, air conditioning, and security systems. These systems work reasonably well after they are programmed. But we can’t control our appliances with our mobile phones, because the United States has still not completely transitioned to the new Internet address system that would give all of our appliances their own Internet addresses. And, unlike in Japan, which I visited last year, when I go to

the supermarket, there's no online information about perishable items.

"The family's main worry now is my husband Phil's elderly father, who lives in a small town in northern Wisconsin. He's approaching 95 and has lung problems. His local doctor orders X-rays and MRIs, but these have to be sent by mail to a specialist in Madison for review, because the rural Internet connections are too slow to transmit them. So when Phil talks with the specialist in Madison, it is always a few days after the X-rays and MRIs were taken, and something might have happened in the meantime. Also, my father-in-law's vital signs can't be monitored without going into the hospital. It's a worrisome situation.

"Phil now telecommutes three days a week, but his boss insists that he and his colleagues come to the office on the other two days for meetings. The boss isn't being unreasonable: some of Phil's colleagues still can't get Internet connections fast enough for real-time videoconferencing."

There have been, Joan hastened to add, some good developments. "Phil is in charge of our family finances, and the Internet makes them much easier to manage. We can pay the bill with our mobile phone in some stores. And because most Americans now have faster Internet connections than they did ten years ago, a wide variety of TV programs, movies, music, games, and instructional programs for children are now available. Many people can quickly download these programs with their fiber broadband connections.

"Our daughter, Anne, is now in college studying anthropology. Last summer, she went to northern Arizona on an anthropology field trip. She was able to use her mobile

phone to take pictures and short movies and to dictate brief notes there. She could also use her laptop to write up longer descriptions of what she saw and heard. But she couldn't use her mobile phone to make calls or her laptop to reach the Internet. There simply wasn't any wireless service in that area. She had to use an old-fashioned pay telephone to call us. So we still have some problem areas."

Joan took a couple of sips of coffee and summed up: "All in all, there has been progress, particularly the expansion of fiber Internet access, and substantial innovation. This has helped the economy. But America is still well behind the Internet front runners in Asia and Europe. Moreover, limited competition in the United States has meant that the cost of Internet access has remained higher than it should be. And rural parts of the country and the inner cities still don't have fiber broadband service, because those areas are unprofitable for the communications companies. Mobile-phone technology remains years behind Asia's; the wireless infrastructure is far from complete; and mobile use of the Internet lags well behind Asia and even Europe. Most troubling of all, most Americans don't realize how far behind we are."

This book is about Internet leadership: what it is, why it matters, and the essential role of government in achieving it. The book centers on a leadership race between the United States and Japan that began with an announcement in 2000. That fall, Japan's then-prime minister, Yoshiro Mori, asserted that his country would be the world's Internet leader by 2005. He wasn't taken seriously in Japan or overseas:

The United States was the globally acknowledged Internet champion, and Japan trailed behind substantially. But in early 2001, Japan's new Koizumi government began implementing a bold plan to achieve Internet leadership, and the incoming Bush administration turned its back on information technology. By the end of 2005, Japan led the United States and most of the world in the availability and usage of ultra-fast broadband and mobile-phone Internet use, the two most important dimensions of Internet leadership. And the United States was drifting *further* behind.

Japan also narrowed the gap with the United States in other dimensions of Internet leadership. With less than half of the U.S. population, Japan continued to produce more native-born Internet engineers than the United States did – and Japan attracted tens of thousands of foreign information-technology (IT) specialists. It made IT a main focus of government research and development funding and invested nearly as much in information technology R&D as the United States did from 2001 to 2005. It encouraged commercially oriented university IT research, and the number of Japanese patents, second only to the United States, increased. Moreover, Japan smoothed the path for bringing university research ideas to market, and promoted venture-capital funding.

The United States is still among the world's leaders in electronic government and remains well ahead of Japan in that respect. And the United States may have better integrated the Internet into the K-12 curriculum, although the schools in both countries are well connected. But Japan now leads in computer-based e-commerce, and it has surged

well ahead in mobile-phone-based m(obile)-commerce. Further, the Japanese government is succeeding in providing universal fiber broadband service, which may be more than a decade away in the United States. And the Japanese accomplished all of this in just eight years of concerted effort.

Does it make a difference which country has the Internet lead? It makes a *huge* difference. As the Bill Clinton-Al Gore era demonstrated, technological advance is a major driver of sustainable economic growth. From 1996 to 2000, information technology accounted for fully one-third of U.S. economic growth. Moreover, one 2001 study indicates that the U.S. economy might have grown by \$500 billion yearly if all Americans had enjoyed even the very slow broadband Internet access of that day – and that such access, if universal, might have created as many as 1.2 million new jobs.¹ Universal broadband would also have helped solve other pressing problems, such as energy independence, healthcare, education, and homeland security.

Technological advances also bring with them opportunities for innovation. Five large, new, Internet-related markets now exist or are in the offing: high-speed (advanced DSL and cable) broadband; ultra-fast (fiber) broadband; third-generation mobile-phone; fourth-generation mobile-phone; and ubiquitous (combined ultra-fast broadband and wireless) networks. Once 10 million people or so begin using each of those new technologies, a new market emerges that strongly encourages innovation: new applications, products, services, and “content.” With nearly nationwide fiber and advanced wireless infrastructure already in place, three of

those five markets already exist in Japan (high-speed and ultra-high-speed broadband; third-generation mobile phone). This means that Japan (and her Asian neighbors) have first crack at innovating for those markets.

Japan plans to launch ultra-fast mobile phones and ubiquitous networks in 2010. When ten million subscribers begin using *those* new services, the Japanese will have additional opportunities for innovation. America's Microsofts and IBMs are unlikely to be left behind; they are deeply involved in what is happening overseas, particularly in Asia. But America's smaller firms, where the bulk of our innovation takes place, will suffer.

Furthermore, Internet leadership brings special, quality-of-life advances suggested in the 2015 scenarios. So securing it, or at least keeping pace with the leaders, looms as a crucial factor in America's current – and future – economic and social wellbeing

Why did Japan rise so quickly and the United States fall behind? This book tells the story of the decisions and events in both countries that determined their present positions in each dimension of Internet leadership. In a nutshell, the Japanese government in 2001 took the Clinton-Gore-era economic success – and the 21st Century's likely economic trends – more seriously than the American government did. The Japanese government understood the critical importance of information technology to the nation's future welfare, and it recognized the essential role that government must play in achieving Internet leadership.

But it's time to get on with our story.

Chapter 2. America takes the lead

Jack Ruina had a problem. Appointed director of the Pentagon's blue-sky Advanced Research Projects Agency (ARPA) in 1961, early in the Kennedy administration, he reluctantly agreed to take over a huge Q-32 mainframe computer in Santa Monica and the staff that ran it, because the Air Force could no longer afford to pay the staff. At about the same time, Ruina's Pentagon superiors saddled him with an improbable research project: one of the Army brass thought that social-science techniques could be used to squeeze usable intelligence from cocktail-party conversations. Ruina now had to find someone who knew something about computers and social science.

Ruina quickly learned there were only two qualified people in the entire country. One was Harvard professor Fred Frick; the other, MIT professor J.C.R. Licklider. Both were then working at MIT's Lincoln Lab, and neither wanted to leave. Ruina was, however, able to persuade them to come to Washington to listen to his pitch. Ruina failed to convince either man, but another Pentagon official got them to agree the job was so important that one should take it. After neither could convince the other to take the job, they de-