PART III— NATIONAL PURPOSES

WHY IS IT THAT SOME PARTS OF THE U.S. ECONOMY HAVE GREATLY IMPROVED their performance through the use of technology while others lag far behind?

Why is it that banks have moved their data and transactions online over the past decade, but hospitals collect and disseminate data just as they did 20 years ago?

Why is it that printed newspapers are disappearing, but a high school student's backpack contains the same 25 pounds of textbooks it did decades ago?

Why is it that many jobs are posted online, but too many Americans—particularly in low-income and minority communities—lack the access or skills to see those postings?

Why is it that a football helmet allows a coach and his quarterback to communicate, but first responders from different jurisdictions still cannot communicate at the scene of a disaster?

The private sector offers some hints to the answers to these questions. In their book *Wired for Innovation*, Massachusetts Institute of Technology professors Erik Brynjolfsson and Adam Saunders[1] explore why certain companies benefit from the use of information technology while other similarly situated companies do not. They find that companies only realize the benefits of technology if they also change their fundamental processes and develop a "digital culture."[2] Technology alone is not enough.

The 1990 paper "The Dynamo and the Computer"[3] reveals more clues. In the paper, Stanford professor Paul David tries to explain why major technological innovations in the 1980s had not yet shown up in productivity statistics by the start of the 1990s.

Part of the answer was a "diffusion lag."[4] It takes time for a new technical system to replace an existing technical system. For example, in the early 1900s "the transformation of industrial processes by the new electric power technology was a long-delayed and far from automatic business."[5] Factories didn't reach 50% electrification until four decades after the first central power station opened.[6]

This lag was due in part to the unprofitability of replacing "production technologies adapted to the old regime of mechanical power derived from water and steam." [7] In other words, the problem was not getting electricity—it was reengineering factories designed and optimized for the steam era to embrace the potential benefits of electric power.

Similarly, today some sectors suffer a diffusion lag. The world, the economy and our lifestyles are all moving from analog to digital. Yet some sectors—particularly health care, education, energy, public safety and government generally—have not adapted their processes to take advantage of the modern communications era. Today's diffusion lag precludes the country from realizing the improvements broadband can bring in key national priority areas.

To help America realize world-leading high performance, Congress directed that the National Broadband Plan include a "plan for use of broadband infrastructure and services in advancing consumer welfare, civic participation, public safety and homeland security, community development, health care delivery, energy independence and efficiency, education, worker training, private sector investment, entrepreneurial activity, job creation and economic growth and other national purposes."[8]

Each of these priorities is unique—each faces different challenges, offers different opportunities and demands a different response. As great as the differences are among these national purposes, certain themes are common. For example, there are connectivity requirements for institutions and for relevant functions. Yet in many cases today's connectivity levels are insufficient for current use, let alone the needs of potential future applications. In addition, the right incentives to motivate the use of broadband are critical, yet incentive structures are often hampered by entrenched interests and even deeper entrenched ways of thought.

Across all these priorities, broadband enables the free and efficient exchange of information. Doctors can understand the needs of their patients better and faster by exchanging electronic health records, which improves the quality of care and reduces costs. Smart meters for energy can arm consumers and businesses with information to reduce energy consumption and unlock new opportunities for energy entrepreneurship. Citizens can have better visibility into and involvement in policymaking.

Broadband also removes barriers of time and space. A patient can be monitored at home 24 hours a day, seven days a week. The elderly and frail can avoid frequent trips to the doctor's office that might expose them to illness. A brilliant physics teacher can engage students in classrooms across the country. A working mother can advance her career by taking a job training course at her convenience. A small business in rural America can transact efficiently with customers and suppliers worldwide at any time.

Finally, broadband allows for aggregation of information. With sophisticated data storage, transfer and mining techniques, medical researchers can develop new treatments that improve medical practice. Similarly, teachers can analyze the impact of particular instructional strategies on student progress toward specific learning objectives. The chapters that follow include recommendations that aim to unlock the value of personal data for new applications and research, while taking into account privacy considerations.

In addition to these common themes, several common

recommendations span these national priorities.

The connectivity needs of institutions that may further national purposes are varied, and no single solution fits all. But collaboration and coordination between these institutions has significant potential to meet connectivity requirements. Government policy can promote and facilitate that collaboration.

In the past, many institutions have used a collaborative model to achieve connectivity. The Internet2 Project was established in 1996 by 34 university researchers to better support the unique needs of the research community like data mining, medical imaging and particle physics. This partnership and others like it (e.g., National LambdaRail) have emerged to provide the unique capabilities that our nation's top institutions require.

Unfortunately, the job of connecting all of our institutions is not complete. The proposed Unified Community Anchor Network (UCAN) (see Chapter 8) and other networks like it would extend the collaborative model favored by many of our research institutions for the benefit of our other community institutions such as rural health clinics and community colleges. UCAN would enable more demand aggregation and sharing, remove barriers to entry and support efforts to and empower all of our community institutions that need connectivity.[9]

Additionally, national priorities should not be restricted by caps on bandwidth. Broadband usage patterns and pricing models are evolving rapidly. In some cases, fixed and mobile broadband service providers have put in place volume caps that have differential impact on users; in other cases, they have offered specific plans that charge on a usage basis. Such pricing schemes may raise policy issues, but it is premature for this plan to address them, as there are a wide variety of methods by which they can be implemented.

If ISPs adopt volume caps or usage-based pricing as the model for how broadband should be priced, the FCC should ensure that such decisions do not inhibit the use of broadband for public purposes such as education, health care, public safety, job training and general government uses.

It is critical that the country move now to enact the recommendations in this part of the plan in order to accelerate the transformation that broadband can bring in areas so vital to the nation's prosperity. Diffusion of new technologies can take time, but the country does not have time to spare. There are students to inspire, lives to save, resources to conserve and people to put back to work. Integrating broadband into national priorities will not only change the way things are done, but also the results that can be achieved for Americans.

PART III ENDNOTES

1 Erik Brynjolfsson & Adam Saunders, Wired for Innovation: How Information Technology is Reshaping the Economy (2010) (Brynjolfsson & Saunders, Wired for Innovation).

2 Brynjolfsson & Saunders, Wired for Innovation at xii–xiii.

3 Paul A. David, *The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox*, 80 AEA Paper & Proceedings 355 (1990) (David, The Dynamo and the Computer).

4 David, *The Dynamo and the Computer* at 358–59.

5 David, *The Dynamo and the Computer* at 357.

6 David, *The Dynamo and the Computer* at 356–57.

7 David, *The Dynamo and the Computer* at 357.

8 American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 6001(k)(2)(D), 123 Stat. 115, 516 (2009).

9 *See generally* U.S. R&E Networks and HIMSS Reply in re NBP PN #30 (*Reply Comments Sought in Support of National Broadband Plan—NBP Public Notice* #30, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, 25 FCC 241 (WCB 2010) (*NBP PN #30*)), filed Jan. 27, 2010; Commenters Supporting Anchor Institution Networks Reply in re NBP PN #30, filed Jan. 27, 2010.