A FRAMEWORK FOR ANALYSIS

A HEATED DEBATE OVER NEW technology unfolded on the floor of the U.S. Senate in 1930. Some senators were incensed because the Chesapeake and Potomac Telephone Company wanted to replace operator-assisted phones with a new device called the rotary dial telephone. Rather than using a human operator to place a call, legislators would have to dial their own calls.

Senator Carter Glass complained that dial phones were overly complicated and "difficult to operate." Senator Clarence Dill also commented on the difficulty in using the new phones: "One has to use both hands to dial," he lamented. In addition, users "must be in a position where there is good light, day or night, in order to see the number; and if he happens to turn the dial not quite far enough, then he gets a wrong connection."[1] Dill claimed that the new phones were especially difficult for older members of Congress.

Other senators challenged these assertions and argued that the new phones actually were easier to use. Senator Millard Tydings noted that legislators could place calls themselves and without going through a central switchboard. It was a more efficient way to work, and it gave callers more control over their telephoning, he noted.

At the end of the debate, the majority was not persuaded. The Senate passed a resolution delaying adoption of the new communications system. The stalemate was not broken until the phone company announced a compromise. It offered to install either dial or operator phones for individual senators, according to their wishes. Thus technology innovation could proceed in a way that was compatible with the preferences of individual members.

The controversy over rotary telephones was not unusual. New technologies often inflame passions, divide people, and raise questions regarding personal and societal impact. By their very nature, they are disruptive because of their ramifications for the way society and government function and the manner in which people interact with one another. Proponents of technology always tout a range of benefits, while critics worry about negative consequences for social life, political institutions, and individual values.

This book does not seek to resolve fundamental disputes over the value of every invention. Rather, it focuses on how the next wave of digital technologies can be harnessed to further U.S. social and political innovation. My goal is to explore a range of specific developments in the contemporary period, analyze what they mean for individuals, society, and government, and understand which barriers limit their enactment.

There are many possibilities for digital technology that are consistent with personal and social values. Governments and other organizations can employ new advances that allow them to perform faster, smarter, and more efficiently. People can deploy digital technology to improve transparency, participation, and collaboration. By working with the private sector, political leaders can stimulate a flowering of innovation in a variety of policy areas.

But proponents must be aware of public fears, institutional barriers, and the real privacy and security threats posed by digital developments. Technology rarely drives change in isolation from other forces.[2] Effective implementation arises from a combination of technology, organizational shifts, and policy reforms. The task

is to further innovation while also protecting basic social and individual values.

THE VIRTUES OF TECHNOLOGY INNOVATION

Technology innovation represents one of the most important keys to long-term prosperity and competitiveness. One of the reasons why the United States thrived after World War II and in following decades was its emphasis on invention. The nation brought to its shores leading scientists from European countries and supported their basic and applied research.

The results were spectacular. The United States became a world leader in science and technology. The early Russian launch of the Sputnik satellite notwithstanding, the United States became the first nation to put a man on the moon and successfully commercialized products derived from the space program such as satellite communications, global positioning systems, and wireless communications.[3]

Scientists undertook basic work in computer science, material sciences, genomics, neuroscience, and cognitive science that launched new industries and created vast wealth. Digital technology and the life sciences spawned the computer revolution, new medical treatments, and the deciphering of the human genome, among other things. Like the electric grid of the early twentieth century and the interstate highway system of the late twentieth century, the Internet became an infrastructure platform for progress in education, health care, energy efficiency, communications, and mass entertainment.

Not surprisingly, given the potential of these technologies, a number of countries have identified broadband and wireless as crucial for national development. Broadband is viewed in many places as the key driver of economic development, social connections, and civic engagement. In a study based on the experience of 120 nations between 1980 and 2006, Christine Qiang estimates that each 10 percentage point increase in broadband penetration

adds 1.3 percent to a high-income country's gross domestic product and 1.21 percent to that of low- to middle-income nations.[4]

Broadband is crucial because it is a cross-cutting technology that speeds innovation in health care, education, energy, and social networking. High-speed broadband allows physicians to share digital images with colleagues in other geographic areas. Schools are able to extend distance learning to underserved populations. Smart electric grids produce greater efficiency in monitoring energy consumption and contribute to more environment-friendly policies. Video conferencing facilities save government and businesses large amounts of money in travel expenses. New digital platforms across a variety of policy domains spur usage and innovation and bring additional people, businesses, and services into the Internet revolution.[5]

The goal of these and other new technologies is to improve communications, organizational efficiency, and individual effectiveness. By democratizing information production, technology lowers the cost of information and reduces the barriers to entry within a number of fields.[6] With modest resources, and without reliance on large-scale capital and human manpower, it is possible to create new software, devise novel applications, and bring new products to market.

THE RISKS OF TECHNOLOGY INNOVATION

While digital technologies offer many benefits, they also raise important questions about social and individual values. Many worry about privacy, security, and societal impact, among other issues. Is it possible to maintain individual privacy and security in a wired world? What happens to social organizations when interactions and social delivery move from face-to-face to electronic communications? Will health information and education technology improve treatment and learning or merely represent a new way of delivering current services?

Every historical era has seen major conflicts over technology innovation. The printing press is thought to have been disruptive to the established religious and political order of medieval Europe. In a world where knowledge was controlled by kings and popes, Johannes Gutenberg's invention reduced the costs of information and facilitated broader production and dissemination of knowledge. Its emergence laid the communications groundwork for what became major upheavals in religion and governance.

The same was true for radio and television. Television is blamed for a reduction in the quantity and quality of political news and the superficiality and inaccuracy of civic discourse. With its emphasis on visual communication and short sound bites, television brought new types of political leaders to the forefront and helped them win elective office. Broadcast media speeded up the news cycle and, with the addition of cable channels and opinionated hosts, undermined the civility of public discussions.

People worry about how to maintain confidentiality of online services and transactions and how to avoid the deleterious features of virtual interactions in the digital world. The emergence of spam, hackers, and coordinated security intrusions challenges electronic communications. These concerns slow the adoption of technology innovation and raise costs for consumers, businesses, and government agencies.

The key challenge for policymakers is to find ways to balance competing goals such as innovation, privacy, and security. There is an inherent tension across these dimensions. The more money spent on security, for example, the higher software costs become and the more difficult it is for small innovators to create new products.

There also is a trade-off between privacy and security. It is possible to improve computer security by allowing more monitoring of suspicious activities. But opening up back channels to surveillance compromises personal privacy and makes individual confidentiality more difficult to maintain.

HOW TO INNOVATE EFFECTIVELY

Effective digital innovation is facilitated by a combination of new technology, organizational restructuring, and policy changes. One without the others does not make for successful social or political innovation. A strategy for innovation is most effective when it alters organizational routines, redirects resources, creates economies of scale, and increases efficiency and productivity among the general workforce.[7] For example, private sector companies have been successful at using technology to drive organizational change. Businesses deploy information technology to improve worker productivity, reengineer corporate practices, and reduce hierarchy in organizations. They automate repetitive tasks, cut out middle managers, and facilitate digital communication flows across levels of the organization. These changes help businesses become more efficient without compromising their ability to deliver needed services.

Governments have been less successful in replicating this formula. Flattening organizations is difficult for public agencies because it involves laying off mid-level managers. Although many agencies perform repetitive tasks, service delivery to citizens in a public setting often involves great nuance from case to case. The complexity of the requests that come before agencies makes it difficult for them to automate. People want their individual circumstances incorporated into the government decision, not simply a uniform response. Part and parcel of government administration is discretion to adjust responses based on individual circumstances.

In addition, some government agencies are unwilling to use technology to change organizational routines. Rather than seeing technology as a chance to alter work roles and organizational practices, executives use it to reinforce existing arrangements. They do not take advantage of new delivery systems to make fundamental changes within their own agencies. This limits the transformational potential of digital government.

Yet those are exactly the types of alterations required to reap the benefits of digital technology. If agencies wish to gain the benefits of technology innovation, they need to alter organizational routines and make policy changes that facilitate the efficiencies and economies of scale made possible through new approaches.[8] This is a strategy that has worked well in the private sector, and it also has the potential to be effective in the public arena.

Limits on the ability of public organizations to embrace change does not mean that effective government innovation is impossible. Rather, the analysis of innovation in public and private sector organizations demonstrates that change is possible under given sets of conditions.[9]

The analysis suggests that there are five keys to effective innovation. First, successful adopters must devote sufficient resources to the innovation process. One of the reasons why the private sector is more successful than government agencies at technology innovation is that businesses spend a higher proportion of their overall budget on information technology. According to research I have undertaken, successful companies spend 2.5 percent of their budgets on technology, higher than the average of 1.88 percent found in state government agencies.[10] Financial resources are important because they allow innovators to undertake market research, plan effective strategies, and provide resources up front and throughout the implementation phase.

Second, successful innovators focus on the customer, value market research, and take visitor feedback seriously. In interviewing leaders in various organizations, I found that they attribute effective technology innovation to market research and an understanding of what their customers want. One government official said that he would like to do market research for his agency but lacked the resources to do so. Asked how he got feedback on what visitors liked, he said that the agency monitored its complaint lines, and when dissatisfaction rose, the agency knew it had a problem. But feedback is reactive, not proactive, and by

the time complaints start coming in, it is already too late. The key to customer orientation is undertaking research that anticipates what is going to be problematic down the road. This ability to see around corners is what distinguishes successful from less effective innovators.

Third, technology innovators provide incentives for management and design teams to work together. One of the key requirements in technology innovation is getting organizational incentives right. Too many agencies do not align their management structures and design teams in a way that encourages people to work together. Successful innovation requires breaking down barriers and figuring out how to get people to cooperate. Based on interviews in the public and private sectors, the biggest barrier to innovation is unwillingness to work together across organizational domains. Reaching economies of scale, saving money, and boosting productivity cannot be achieved without organization-wide cooperation.

Fourth, innovators devote time to understanding their competition and determining how to position themselves vis-à-vis market competitors. Business leaders reported that understanding the competition is vital to effective implementation. This is why companies often have an innovation advantage over the public sector. They face competition and will lose money if they do not understand their niche relative to other companies. The problem in the public sector is that agencies generally do not have competitors and public organizations often do not have sufficient incentives to learn from other agencies. This limits their ability to adapt to changing circumstances and makes it difficult for them to adopt new practices.

Finally, successful innovators tie resource allocation to customer satisfaction. Ultimately, there must be clear consequences that result from effective or ineffective technology innovation. Positive outcomes should accrue to units that innovate, understand the competition, and undertake market research. Similarly, there

must be ramifications for failure. Unless organizations incorporate consumer reactions in resource decisions, staff members will not take consumer views seriously. In the public arena, agencies can get visitor feedback in a variety of ways: online surveys, comment forms, systematic surveys regarding visitor experiences, collaborative decisionmaking, and crowd-sourcing processes. These mechanisms need to be added to organizational decisionmaking so that those agencies getting positive reviews receive a bonus for excellent performance.

CASE SELECTION

In this volume I examine a variety of different types of social and political innovation. Among the developments reviewed here are changes in public and private sector innovation (for example, electronic government and customer-driven health care), platform shifts (such as cloud computing and broadband), and social innovations (such as personalized medicine, mobile communications, and digital media).

These cases represent different types of innovation and illustrate ways to balance competing objectives. In each example, I look at what the innovation involves, what barriers complicate successful implementation, and ways to overcome real or potential problems. The goal is to understand the dynamics of innovation and policy actions that encourage progress.

Several common features of innovation occur across these disparate areas. These include strong leadership, proper financing, organizational coordination, favorable policy incentives, and a supportive political environment. In each case, I examine each of these features to understand how to innovate most effectively.

I employ a variety of methodologies to study technology innovation. These include case studies of successful innovations, interviews with leading observers, opinion surveys outlining public attitudes, and analysis of technology data. I combine different types of approaches to analyze how new technologies are

transforming organizations, what factors promote innovation, and how barriers to change might be overcome.

PLAN OF THE BOOK

The book is organized in five parts dealing with technology innovation, digital platform, policy considerations, normative concerns, and a conclusion that addresses ways to facilitate innovation. Part 1 emphasizes technology advances in the public and private sectors. In chapter 2, I look at the public sector and examine how technology can make government faster, smarter, and more efficient. I argue that technology changes the relationship between citizens and leaders and creates opportunities for enhanced transparency, participation, collaboration, and social networking. In this chapter, I review the manner in which technology enables agency change and furthers citizen engagement with government and explore the barriers to public sector innovation.

Chapter 3 examines private sector technology innovation in the realm of health care. A revolution is taking place in medical care, powered in part by technology that is empowering ordinary patients. Consumers have access to more information than ever before, and they are using new digital tools to share cost information and learn about treatment options. This shift breaks down the hierarchy that has dominated the industry and gives people more control over their health care. In this chapter, I look at customer-driven health care and the opportunities and limits it presents.

Part 2 focuses on platform shifts to cloud computing and broadband. Chapter 4 examines ways public agencies can save money through cloud computing. I review examples of successful migration from local to remote file servers and how government officials have saved substantial amounts of money. Through more efficient file storage, reduced personnel costs, and more effective use of technology resources, cloud computing can safeguard financial resources and produce better results for citizens and

government officials. There are, however, privacy and security concerns that complicate the future of cloud computing.

Chapter 5 investigates innovation through the adoption of high-speed broadband. I examine the experience of four countries in broadband development, both new efficiencies and economies they have achieved and problems they are encountering. I review cases of effective implementation and the new applications that have been developed elsewhere.

Part 3 looks at policy aspects of innovation. Chapter 6 examines the differential rate of technology innovation between the public and private sectors. In many respects, the public sector has been slower to innovate than the business world. I compare innovation across government agencies and leading companies and show why government lags, what values it emphasizes that are sometimes ignored in the private sector, and what it can do to catch up.

Chapter 7 looks at mobile communications and consumer experiences of that technology. The rise of handheld devices has altered the way people acquire information and use digital technology. Information and services are increasingly being accessed through mobile devices. However, not all consumers are happy with their mobile experiences. In this chapter, I review survey data regarding mobile communications and discuss some of the changes users would like to see in their mobile plans and what they are willing to pay for various services.

Part 4 explores the normative aspects of innovation. Chapter 8 focuses on personalized medicine and health information technology. Advances in human genomics and information technology make it possible to envision a situation in which treatments are tailored to individual genetic structures, prescriptions are analyzed in advance for likely effectiveness, and researchers study clinical data in real time to learn what works. Yet there are privacy and confidentiality concerns that affect people's views about genomics and health information technology. In this chapter, I review

normative and operational aspects of personalized medicine and what changes are required to increase the use of genomics and health information technology.

Chapter 9 investigates the future of the new media and the way people acquire information. Traditional news organizations have faced a perfect storm of financial disaster. Between new technologies and disruptions of their previous business models, they are reinventing themselves and using the Internet as their major delivery system. This has altered the way the news media function and the manner in which people get information. I explore what this new media universe looks like, what risks and opportunities are present, and what steps are needed to strengthen news organizations.

Chapter 10 examines the challenges raised by digital technology for privacy and security. New platforms generate present and potential problems in maintaining confidentiality in a digital era and protecting consumers from corporate, government, and international snooping. New technologies create opportunities for individual action but entail risks in terms of safeguarding basic rights. I examine ways to maintain privacy and security in a digital age.

The final part presents a summary of the book and addresses the transformational potential of new technologies. I discuss what must be done to encourage future innovation. The agenda for change must encourage entrepreneurship and innovation and align organizational structure with technology innovation. I outline concrete policy actions needed to allow Americans to gain the full advantages of digital technologies.