

# Executive Summary

**E**lectronic transactions are now commonplace in the U.S. business environment. Consumers use electronic technologies daily to transfer funds, make credit card purchases, buy stock, and browse electronic catalogues. Businesses, too, rely heavily on electronic technology for record-keeping, accounting, inventory control, production management, and purchasing and sales. This use of networked information technology barely hints, however, at its full potential for improving U.S. economic performance in the future.

Competition from abroad has forced American businesses to seek new, more productive ways to organize their operations and carry out their work. These innovative methods include total quality control, customer-driven planning, lean production, agile manufacturing, just-in-time manufacturing, and electronic integrated enterprises. An advanced communication and information infrastructure, such as that embodied in the concept of a National Information Infrastructure (NII), could greatly enhance these new management and production tools and improve overall U.S. economic performance.

This report identifies and frames the technological, economic, and social issues related to the use of electronic networks for business and commerce. It focuses on the features that must become part of an NII, as well as the social and economic conditions needed to support it. In an electronically networked economy, the design and underlying architecture of the global information infrastructure will have a major impact on national economic growth and development. However, if all American businesses—large and small, national and multinational, service and manufacturing—are to fully benefit from electronic commerce, national

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infrastructure policy must also consider the social and economic factors associated with its use.

### POTENTIAL IMPACTS OF ELECTRONIC NETWORKS

Changes in the world economy and the global business environment require American businesses to adapt through innovation. These changes include: 1) the emergence of a highly competitive global economy in which multinational corporations play a greater role; 2) the growing importance of information as an economic resource and basis for competitive advantage; and 3) a shift from mass production to a system of customized, flexible production.

Information and communication technologies are driving and facilitating the adaptation of American businesses to these changes. Businesses are now using these technologies in nearly all of their operations: from recruiting to downsizing, from ordering materials to manufacturing products, from analyzing markets to developing strategic plans, and from inventing technologies to designing new uses for them. Early users of these technologies gain a strategic advantage; latecomers must eventually adopt them just to survive,

Networked information technologies are especially useful in helping firms to restructure and re-engineer their operations to become more competitive. Businesses are using these technologies to reorganize their activities into more versatile and flexible networks and teams. Some businesses, for example, are using networking technologies to build long-term, integrated business relationships with their customers and suppliers. Others are teaming up with outside firms for specific, short-term ventures. Some of these business relationships, operating through electronic networks, cross national as well as organizational boundaries. Networking technologies such as wide area networks (WANs), videoconferencing, computer-integrated engineering and manufacturing, and electronic data interchange (EDI) are necessary to support these flexible business arrangements.

While information and communication technologies have an impact on how firms conduct their business, they will also affect the size, structure, and openness of markets. As these technologies are integrated into reliable commercial networks, more trade will take place in electronic markets, online. How these electronic markets evolve and the form they take will have significant consequences for the functioning of the economy as a whole. Electronic markets can reduce the net costs of doing business, and thus improve overall efficiency and expand trade. However, if these networks fail to interconnect, or are unevenly deployed, they could create technological barriers to trade and restrict competition.

### TECHNICAL CRITERIA FOR SUCCESS

The “architecture” of electronic networks will be critical in determining the impacts of electronic commerce. Like a sculpture that is fashioned from Tinker Toys, a network’s structure is determined by the connections and linkages that give it shape. How these networks are formed and joined together in a national infrastructure will determine the size and scope of markets, as well as the gains in trade, the distribution of costs and benefits throughout the economy, the nature of work, and the quality of jobs.

Information networking technologies will need to be varied, flexible, open, and easily interconnected if they are to serve business and the nation’s needs. Flexibility and choice allow businesses to move quickly and strategically to respond to changing circumstances and market demand, and to mix and match network components to develop new products and services. Open, interoperable systems, which can be easily interconnected, reduce business transaction costs and barriers to market entry. Technology diffusion will also occur faster and more broadly because interoperable components are cheaper and easier to use. In addition, interoperable systems provide a standard platform for the innovation and development of new components and applications.

If everyone is to share the benefits of electronic networks, the technology must also be widely deployed. The first developer of a commerce network can gain a significant competitive advantage, if investment costs are high and the market is limited. Potential competitors may be unable to attract enough users to justify the cost of establishing additional networks. Latecomers in the business network game will also be disadvantaged because they lack the hands-on experience needed for network development and operation. Although the profits gained from an early competitive advantage may stimulate further network investment, this competitive advantage could lead to anticompetitive behavior if too many newcomers are discouraged or locked out of the market.

### **TECHNOLOGY ALONE IS NOT ENOUGH**

The most sophisticated technology and the best designed network architecture will not achieve their potential payoff unless businesses change their attitudes and business procedures. Fortunately, new communication and information technologies are subversive; they can serve as agents of change, helping firms to make the necessary adjustments. In a networked business environment, cooperation among firms can prove more rewarding than unbridled competition, and information-sharing more fruitful than information control. Moreover, with the rapid social, economic, and technology changes taking place, the most successful businesses will likely be those that use information technologies to adapt to their changing environment, rather than to control situations and events.

The workplace environment will be critically important. The shift from mass production to customized, flexible production will require a highly skilled and flexible workforce. Information technologies can affect the workplace in one of two entirely different ways. Management can use technology counterproductively to monitor workers, reduce skill levels, or replace permanent workers with contingent labor. Or these same technologies can be used beneficially to improve workers skills, integrate employees into the deci-

sion process, and encourage team participation. If the benefits of electronic commerce are to be realized, business strategies will need to foster job quality, wages to support a high living standard, and a collaborative work environment.

### **IMPLICATIONS OF INFORMATION TECHNOLOGY CHOICES**

The age-old adage that “knowledge is power” is nowhere more applicable than in a knowledge-based society. Whether in work relationships within a firm, competition in the marketplace, or trading relations among nations, having access to information and the ability to use it are the keys to success or failure.

This has always been the case, of course. What is different today is the extent to which knowledge is now embedded in information and communication technologies. As a result, choices about the design, architecture and structure, or the rules and regulations of network technologies will be irreversible in the short- to medium-term. Once technological decisions are made, technology develops along a given path. This is particularly true for networked information technologies, which require huge amounts of sunk capital and social investment. Thus, this period of rapid technological advancement provides a rare opportunity to assess and direct technological developments and the economic and social relationships associated with them. With the stakes high, and the potential for winners and losers, care must be given not only to the choice of technologies, but also to the participants in the decisionmaking process.

### **POTENTIAL ROLES FOR GOVERNMENT**

With major changes in the world economy, all nations are rethinking their government’s responsibility for maintaining their economies. Russia and the Republics of the former Soviet Union and Eastern Bloc are undergoing the most dramatic readjustment to free markets. Europe is struggling with the transition to a single, unified market where national governments play a lesser role. Japan is experiencing similar doubts and reservations about its economic future, while trying to

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sort out its government's role in pulling the country out of a severe recession.

The United States faces its own global readjustment. This will require that the nation move beyond the unproductive debate about whether the nation should have an "industrial policy" and begin to identify the joint interests of business and government and how they can mutually support one another. Government has always had a role—and cannot avoid its involvement—in structuring economic relations and outcomes.

In the context of the National Information Infrastructure, the private sector clearly has the primary role for developing, deploying, and operating the NH. For the most part, industry will develop the technology, provide bandwidth, offer connectivity, and ensure the availability of services and products in the pursuit of profit. Government, however, cannot stand idly by. In its various roles as regulator, broker, promoter, educator, and

institution-builder, the government must establish the rules of the game and the incentive structure that will help determine private sector choices.

The same is true for electronic commerce. In government's role as regulator, it will need to ensure that electronic markets are evenly deployed, open, and accessible on an equitable basis. Acting as a broker, the government can bring together potential, but disparate, network users, thereby helping to generate a critical mass. As a promoter, the government can take steps to overcome market failures. As an educator, the government can promote electronic commerce by fostering demand through the effective use of networking technologies. Finally, and most importantly, the government can create an institutional environment that strives to assure that electronic commerce is conducted in a manner consistent with the nation's overall social and economic objectives.