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POLICY BRIEF

The National Investment in Information Technology R&D

The burgeoning use of information technologies throughout society is changing the way Americans live, learn, work, and play. Yet the information revolution did not emerge by accident — the extraordinary pace of progress in IT and the strength of U.S. IT industries are *built on a foundation* of federal investments in long-term, fundamental information technology R&D made over the course of the last several decades.

Public support for computing and communications research has *yielded spectacular returns*: desktop computing, imaging technologies, local and global digital communications networks, electronic commerce, and high-end scientific computing all have origins deeply rooted in the federal research program. Carefully planned, long-range investments by federal research agencies continue to stimulate revolutionary advances, leading to new information technology products and services, even whole new industries, and enriching the lives of Americans as individuals, workers, citizens, and consumers.

Advances in information technology are fueling unprecedented economic growth and prosperity. The performance of the U.S. economy in recent years demonstrates the importance of IT to the Nation:

- IT producers were responsible for *more than one-third of real economic growth* in 1995-98, despite accounting for only 8 percent of GDP.
- IT industries account for more than $500 billion of the annual U.S. economy.
- The "Internet economy" alone generated $300 billion in revenues in 1998, already rivaling century-old sectors like energy and automobiles.
- Falling prices in IT-producing industries reduced overall inflation by an average 0.7 percentage points in 1996-97.
- Average value-added per worker in IT-producing industries grew by more than 10 percent annually during 1990-97.
- IT companies create millions of new high-paying jobs and enable productivity increases *throughout* the economy.

The strength of the IT sector, however, cannot be taken for granted nor as a sign that federal research agencies can safely retreat from their support for IT research — **an adequate national IT R&D enterprise remains *beyond the scope* of any one sector**. As the dynamic pace, short product lifecycles, and intense competitive pressures on prices and profit margins in the IT marketplace require IT firms to devote the bulk of their R&D resources to shorter-term applied research and product development, the appropriate government role in sponsoring long-term, broad-based, fundamental research becomes even more important.

After thoughtful examination, a Congressionally chartered panel has concluded that **the Nation is underinvesting in information technology research**. In its February 1999 report, the President's Information Technologies Advisory Committee (PITAC) demonstrates that **critical problems are going unsolved and the rate of flow of new ideas is dangerously low**. The PITAC recommends that the federal investment in information technology R&D be increased by $1 billion over 5 years and that support be refocused on high-risk, high-payoff research — the primary source of new information technologies and the success of U.S. firms in the global IT marketplace.

Given the proven track record of federal investments in IT R&D; the critical role of information technologies in the economy and quality of life in the U.S.; and the current inadequacies of public support for fundamental IT research, the implications for federal policy are clear and were succinctly expressed by the PITAC: "**Today's investment choices about IT research will determine how well America is able to achieve its 21st century aspirations**."

On the Federal Role in Information Technology R&D

"As we approach the 21st century, the opportunities for innovation in IT are larger than they have ever been — and more important. We have an essential national interest in ensuring a continued flow of good new ideas in IT. After careful review of the Federal programs, however, this Committee has concluded that Federal support for research in information technology is dangerously inadequate."

– The President's Information Technology Advisory Committee

"Maintaining the Nation's global leadership in information technology will require keeping open the pipeline of new ideas, technologies, and innovations that flow from fundamental research. The Federal Government…has a crucial role to play in supporting the long-term, basic research the private sector requires but is ill-suited to pursue."

– Rep. F. James Sensenbrenner, Chairman, House Science Committee

"The federal government is important to R&D funding precisely because it is able to make long-term investments that create new industries and improved quality of life. The universities and research institutions that receive federal funding invest it in students, researchers, and professors. The very process of research and development creates better minds, better methods of discovery, and better tools."

– Eric A. Benhamou, Chairman and CEO, 3Com Corporation

"The U.S. Government has played a critical role in the evolution and application of advanced computer networking technology and deserves credit for stimulating wide-ranging exploration and experimentation over the course of several decades."

– Vinton G. Cerf, Senior Vice President for Internet Architecture and Technology, MCI WorldCom

"In just the past four years, information technology has been responsible for more than a third of our economic expansion. Without government-funded research, computers, the Internet, communications satellites wouldn't have gotten started…. It all started with research, and we must do more."

– President Bill Clinton (1998)

"Today's microprocessors are roughly 10,000 times faster than their ancestors. And microprocessor-based computer systems now cost only one-fortieth as much as their ancestors, adjusting for inflation. The result: an overall cost-performance improvement of roughly 1 million in only 25 years! This extraordinary advance is why computing plays such a large role in today's world. Had the research at universities and industrial laboratories not occurred—had the complex interplay among government, industry and academia not been so successful—a comparable advance would still be years away."

– William N. Joy, Co-Founder and Vice President for Research, Sun Microsystems, Inc.

"The example of the internet alone makes the case for the unexpected, and often spectacular, outcomes from federal long-term research investments in information technologies."

– Rep. Eddie Bernice Johnson, Ranking Minority Member, House Subcommittee on Basic Research

"Indeed, for nearly 50 years, federal investment has helped to train the people and stimulate the ideas that have made today's computers and many of their applications possible. Federal support early in the life cycle of many ideas has advanced them from novelties to convincing demonstrations that attract private investment to products and services that ultimately add to the quality of U.S. life."

– Computer Sciences and Telecommunications Board, National Research Council

Sources on Information Technology R&D Policy: *Information Technology Research: Investing in our Future*, President's Information Technology Advisory Committee, February 1999; *Computing Research: A National Investment for Leadership in the 21st Century*, Computing Research Association, 1997; *High Performance Computing and Communications: Information Technology Frontiers for a New Millennium*, National Science and Technology Council, May 1999; *The Emerging Digital Economy II*, U.S. Department of Commerce, June 1999; *Funding a Revolution: Government Support for Computing Research*, National Research Council, 1998; *Evolving the High Performance Computing and Communications Initiative to Support the Nation's Information Infrastructure*, National Research Council, 1995