

Government remains essential in the Information Age society. Although there is debate over structure and operation, government's objectives are indisputable: maintaining collective security, administering justice, providing the institutional infrastructure of the economy, ensuring that vital social capital is enhanced through improvements in health and education and through strong families and communities. In its role as a service provider, government needs to be fully capable of delivering high quality, effective, affordable services. However, in cases where government itself is not the best delivery vehicle, it must engage or allow others in the voluntary and profit-making sectors to carry out this role. Information technology, already an essential part of government operations, will continue to be vitally important to administration, decision making, and direct service delivery. It will also be critical in the evolving relationships between government and other kinds of organizations, and between government and citizens.

Today, government is being transformed along several dimensions. Where it was organized to act independently or according to rigid rules, it is now involved in complex patterns of interdependence. Traditional methods of public management based on hierarchical notions of "command and control" are being replaced by approaches that depend on collaboration, negotiation, and incentives among partners. The boundaries between government and business that served as clear lines of separation are now blurring as public-private partnerships emerge to address increasingly complex problems and goals. Citizens are coming to expect vastly different performance from government. They are little concerned with which level or unit or organization delivers a service, but are increasingly concerned that those services be sensible, cost-effective, convenient, and of high quality.

Government has been at the forefront of information technology research and application for decades. We often take for granted that many traditional functions of government, such as the Social Security system and national defense, would not operate at all without information technology. However, today's technical tools, including digital communications and advanced networking, are beginning to offer transformational value to many more functional areas. We can already see their potential in relatively rare government applications that engage citizens directly. The Internal Revenue Service e-file and Telefile programs allow taxpayers to file their returns electronically using technologies as simple as their telephones. The Santa Monica Public Electronic Network (PEN) provides myriad information services to that Southern California community and serves as a virtual host for public discussion of important civic issues. Advanced computing and communications technology make programs like these technically feasible, but alone they are insufficient for achieving the kinds of services that the public demands and deserves. Leadership, management strategies, organizational structures, cross-boundary relationships, financing mechanisms, information policies, and public participation and acceptance are all equally crucial elements of effective 21st Century government services. This extraordinarily complex combination of technical, organizational, economic, human, and political factors explains why applications like e-file and PEN are not at all common. Such programs present huge challenges along all of these dimensions, and because they are governmental, public scrutiny, the limitations of public funding, and the necessity of providing for universal access present enormous risks of failure.

In 1997, the National Science Foundation launched the Digital Government Program to support research projects that will help move American government toward the promise of transformed public services. The program fosters broad connection between government information services providers and research communities, and seeks innovative research to improve agency, interagency, and intergovernmental operations, as well as interactions between citizens and government.

Clearly, no single domain of knowledge will be sufficient to the challenge. Computer and information science, the social and behavioral sciences, and the full range of public policy domains and management disciplines need to be actively engaged. However, effective partnerships among disciplines and between researchers and practitioners face formidable barriers of their own. Different value systems, vocabularies and conceptual frameworks, and lack of awareness and experience of one another all mitigate against the kind of multidisciplinary collaboration that is needed.

In October 1998, a workshop sponsored by the Digital Government Program was convened by the Center for Technology in Government of the University at Albany/SUNY to address these challenges. The workshop focused particularly on the environment in which government information services are developed. It recognized that government programs and service delivery mechanisms are developed in a complex multi-layered Federal-state-local system in which many organizations play significant and different roles. It also emphasized that development efforts must deal with interactions among the political, organizational, technological, economic, and human factors that shape the implementation environment.

### Government needs for the 21st century

By paying special attention to the needs of government program managers, workshop presentations and discussions were designed to lead to research ideas that have the potential to be of pragmatic use in government. Eight specific needs emerged from the discussion.

- **Interoperable systems that are trusted and secure.** Current system development methodologies cannot deal well with the scope and diversity of users, customers, and stakeholders that are involved in large government information systems. Research is needed to understand the potential for and the limits of system integration and scalability in technological, organizational, and political terms.
- **Methods and measures of citizen participation in democratic processes.** Internet technologies can facilitate a more personal involvement in the institutions and processes of government. Easy public access to information, electronic voting, instant public opinion polls, and other possibilities raise important questions about the nature of citizenship, the role of political leadership, and limits of change in democratic institutions.
- **Models of electronic public service transactions and delivery systems.** With the proliferation of the Internet among government agencies and citizens, it is possible to offer new services, integrated services, and self-service in ways and places never before possible. New methods of authentication, record-keeping, security, and access are all needed, as well as new methods of measuring costs and benefits.
- **New models for public-private partnerships and other networked organizational forms.** Given the diversity of players involved in delivering government services, developing effective IT systems often requires new coalitions of partners at all levels of government, and between government and the private and nonprofit sectors. The complexity of the resulting organizational and technological relationships is daunting. Considerable legal, economic, ethical, political, and technological questions attend this evolution to new organizational arrangements.
- **Intuitive decision support tools for public officials.** Technologies and data standards that encourage information search, selection, analysis, and sharing can strongly influence the nature and effectiveness of decision making by elected officials, senior executives, and program managers alike. The use of new tools by decision makers may also have implications for public participation and open government.
- **Archiving and electronic records management.** More and more information now resides in electronic rather than physical files, generating new issues around record definition and content, version control, public access, ongoing preservation, and the ability of government to maintain history and accountability.
- **Better methods of IT management.** Government IT managers need ways to design and maintain more efficient, flexible, and affordable systems. Design processes, project and contract management, leadership models, and strategies for dealing with a shortage of IT professionals are all critical areas for applied research.
- **Matching research resources to government needs.** Applied research is usually not rewarded by academic value systems. As a consequence, researchers often pursue theoretical research instead of field work. Practitioners generally cannot or will not wait for the results of traditional research to influence their decisions, therefore, they seldom make use of research results. The best forms of research on Digital Government must overcome these obstacles and lead to readily useable knowledge.

### Applied research challenges and opportunities

While the needs outlined above present more than ample opportunities for applied research, traditional research models and a historical lack of connection between research and practice present serious obstacles to success.

First, although academic research can have a significant influence on government practices, the government and research communities have very different value systems that need to be taken into account. Government is risk-averse by design, and research is quite the opposite. Government managers often need quick answers, while researchers tend to take a longer-term view. These differences need to be taken into account through the development of new models for informing and integrating practice and research.

Like government, research has its own disciplinary specialties that deepen and expand knowledge within each field. To meet the needs identified above, researchers not only must advance knowledge in individual fields, but must also find synergy across them. In particular, social and information scientists need to work together.

The intricate interdependencies of government programs require a holistic line of research that accounts for the interactions among levels of government and between the public and private sectors. Access to venues for this kind of research will require trusting long-term relationships between researchers and government managers, as

well as substantial multi-year funding.

Finally, policy guidelines, organizational forms, and technology tools constantly interact with one another, generating many questions and conflicts about what is technically possible, organizationally feasible, and socially desirable. Research that focuses on the intersection of these domains is inherently multidisciplinary, complex, and difficult to design and manage, but essential to achieving the goals of Digital Government.

## Digital Government Program recommendations

The complexities of the public sector environment, pressing practitioner needs, critical research challenges, and 35 specific project ideas (see p. 18) emerged from the workshop discussions. Together, these led to six recommendations to the National Science Foundation for furthering the goals of the Digital Government Program:

1. **Support research at the Federal, state, and local levels, as well as investigations into intergovernmental and public-private interaction.** The Digital Government Program should emphasize the multi-faceted nature of American government and encourage projects that look at every level of government, at multi-level functions, and at programs that link the public, private, and nonprofit sectors.
2. **Attend to issues of "governance" as well as "government" in the digital age.** Information technology can play a significant role in transforming not only government services and administration, but also the working of democratic institutions. Projects that focus on the nature and effects of "digital governance," the roles and rights of citizens, and the functioning of civil society should be included in the Digital Government research program.
3. **Encourage both social science and technology research, multidisciplinary projects, and research designs and methods that address service integration and environmental complexity.** In order to be successful, the research program will need to address the interplay among technical, management, policy, and organizational factors influencing the information systems that support government operations. With this diverse set of research questions and objectives, the program should encourage research in both social and information sciences and welcome a variety of research methods, particularly ones that directly involve system users and beneficiaries.
4. **Seek innovative funding models that build a larger resource base for Digital Government initiatives.** At present, the NSF funds allocated to the Digital Government Program are quite modest and are insufficient to support sustained research into the complex questions posed at the workshop. NSF should consider innovative funding models to increase the amount of resources available to support the program by finding co-sponsors and leveraging complementary investments already being made by other organizations.
5. **Link research and practice in an ongoing exchange of knowledge, needs, and experiences.** Given the wide communications gap between the academic and government practitioner communities, and the significant opportunity for improved practices through collaboration, new methods are needed for disseminating research results to practitioners and for infusing research with the problems of practice. NSF should encourage the development of organizational structures, information sharing mechanisms, and funding methods to bridge the gap between these two cultures.
6. **Create a practitioner advisory group for the program and include practitioners in the review panels.** If the Digital Government Program is to succeed in integrating research and practice, practitioners must have a major role in setting priorities and selecting projects to be funded. An advisory group made up of practitioners from all three levels of government would assist in program design, in attracting government funding and research partners, and in disseminating results. Practitioners must also participate in reviewing proposals that seek to study their areas of expertise. This will also help insure the relevance of projects, access to venues for field research, and an audience for the research results.