
IT Innovation in Government: Toward an Applied Research Agenda

**Part One:
Government Information Technology Issues
The Practitioner Perspective**



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Shifting government objectives and information technology opportunities

Public and private sector organizations alike are striving to improve their productivity and

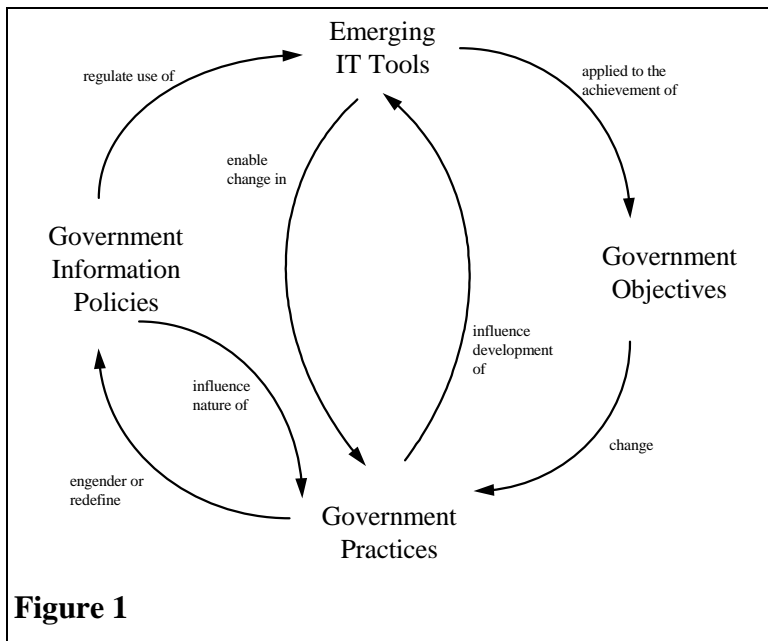


Figure 1

effectiveness by rethinking missions,

reengineering processes, and

implementing information

technology (IT) solutions.

Experience has shown that IT offers

substantial potential benefits to

organizations, but it also gives rise

to new management and policy

challenges. Government program

managers and government information resource managers are faced with new challenges as

priorities shift and program goals and objectives change with the political, economic, and social

environment. The effective use of information and information technology tools are essential to

meeting these shifting programmatic goals. As a consequence, technology and government

objectives, and practices and policies, are interlinked in a ongoing circle of influences as shown

in Figure 1. While many factors outside the boundaries of the figure have an impact on those

included, this discussion focuses on the interrelationships among these four elements.

Emerging IT tools such as the World Wide Web, geographic information systems, and data

warehouses, are being used by government agencies to support programmatic objectives and to

change practice in terms of the way agencies communicate internally, and interact with citizens, the private sector, non-profits, and other government agencies. The implementation of these technologies raises new and different information management and policy challenges and increases public expectations with respect to information access and service delivery. New information policy issues generated by IT use, also influence practice as new legislation and regulations are developed that affect the way agencies collect, use, and disseminate information. As government is also a substantial market for the IT industry, its needs and uses of IT have an effect on industry development of new technologies and applications.

Government has a complex role in the IT environment - as a user of information and information technology, as a custodian and disseminator of information, and as a policymaker. Government is also responsible for setting priorities for and funding IT research and development.

Opportunities for research in government information technology

The value of research to practice reflects the fit between the topics that interest researchers and their funders and the problems that practitioners are trying to solve. It also reflects the effectiveness with which knowledge is transferred between the two domains. Research needs span all of the links indicated in Figure 1. The link from *Emerging IT Tools to Government Practice* is the most obvious and perhaps most often addressed. This type of research tends to focus on how various technologies support the programmatic and service delivery functions of government organizations. Information management is a key component of the link between *Emerging IT Tools* and *Government Practice* and also provides a focus for research. For example, Andersen and Dawes (1991) discuss several specific information management topics

such as the level of risk that is appropriate for government operations in the context of IT implementation; managing the costs of information; managing the pace of technological change; and sustaining a technically skilled workforce. They further indicate that there are three levels of policy that support government information management: work unit policies, organizational policies, and government-wide policies. The interaction among policies, information management requirements, and technology opportunities are also important topics for government IT research.

The link between *Emerging IT Tools* and *Government Objectives* provides another focus for research. As new IT tools become more pervasive, and new and enhanced services become easier to offer, government organizations may reconsider their programmatic objectives. Further, as citizens become increasingly aware of the capabilities of technology, they change their expectations of what government organizations do and how they do it, and this further influences government objectives. Changing objectives, in conjunction with the implementation of *Emerging IT Tools*, influence *Government Practice* in terms of how information is collected, used and disseminated.

While many factors such as the economy and societal issues *influence Government Information Policy*, changes in *Government Practice* also give rise to new *Government Information Policy* challenges. McClure (1996) defines information policy as a set of interrelated principles, laws, guidelines, rules and regulations that guide the creation, management, access, and use of information. Andersen and Dawes (1991) define public information policies as those strategies

that allow us to use information well and adapt government organizations and information systems to a rapidly changing environment.

Changes in Government Objectives such as the shift to Medicaid Managed Care and Welfare Reform, not only change government practice, they also require the identification of appropriate IT strategies to support policy implementation, decision making, and program evaluation. The identification of new IT strategies in turn, requires that policies associated with the creation, access, and use of information be reassessed in light of new objectives and changed practices. As new information policies are developed, they further influence the way that governments operate and manage information. Research that focuses on this link must take into account the relationships between programmatic objectives, and information management practices.

The links between *Government Objectives* and *Emerging IT Tools* and *Government Information Policy* and *Emerging IT Tools* also provide an important focus for research. This research relates to the degree to which the IT industry understands and responds to the needs of government. If the developers of IT tools and applications are to design products and services that meet the needs of government, it is critical that they maintain an awareness of the political and economic environment in which technology solutions will be used as well as the information policies that need to be taken into account in government IT implementations.

Lastly, for all of the areas of research focus outlined above, the effectiveness of the transfer of research to practice is an important consideration. Therefore, research that focuses on identifying

and evaluating mechanisms for the transfer, application, and evaluation of research results is also an important component of an overall government IT research agenda.

Efficiency and effectiveness of public sector information technology research

The areas and opportunities for exploration in government IT research are abundant and complex. The overall efficiency and effectiveness of government IT research depends upon the fit of research to practice and the effectiveness of the transfer of results as well as the degree to which the research conducted is complementary and comprehensive. An overall research agenda that focuses on a few of the links described above, but ignores the others, may fall short in terms of effectively addressing the complexity of issues associated with government IT innovation.

Therefore an efficient and effective overall research agenda should have the following characteristics:

- An appropriate fit between research and practice
- Complementary and non-redundant efforts
- Comprehensiveness in range of technology, management and policy issues
- An effective transfer of results

Further, the usefulness of research depends upon its timeliness. Given the rapidly changing technological and political environments in which government IT research is conducted, it is often difficult to identify, conduct, and transfer the results of research so that it meets the needs of practitioners in the time frame in which the problems need to be solved.

Government Information Technology Issues -- The practitioner perspective

As discussed above, the value of public sector IT research is reflected in the degree to which it meets the needs of practitioners and the effectiveness of the transfer of research to practice.

Following is a preliminary attempt at summarizing and categorizing the issues that government practitioners are attempting to address. The issues discussed below were derived from a number of sources. A search of recent conference and meeting agendas of practitioner organizations (government management or policy associations, public administration organizations, government information technology managers) was conducted and the IT-related issues were identified. CTG's project proposal database describing management and service delivery problems that New York State governments sought to address through innovative uses of IT was also examined. The database contains references for all of the project proposals that have been submitted to CTG by New York state and local government agencies since 1993. Approximately 40 project proposals or descriptions are in the database.

The list of issues identified below is not intended to be comprehensive. Rather, it is intended to provide a framework for further development and analysis and to give examples of the IT-related issues that are of current importance to government. Where specific issues for each of the categories have been identified, they are listed in the beginning of each section. In some cases, only general issues within the categories have been identified thus far. The following sources were used in the initial identification of examples of IT issues from the practitioner perspective:

- National Conference of State Legislators (NCSL) -National Association of Legislative Information Technology - Professional Development Seminar agenda (1997) and NCSL Communications and Information Policy Committee 1997 Annual Meeting agenda

- National Association of State Information Resource Executives (NASIRE) 1997 Annual Conference agenda
- American Public Welfare Association (APWA) Information Systems Management (ISM) 1997 Conference agenda
- International City/County Management Association (ICMA) 1997 Conference
- CIO Magazine (July 1997)
- New York State Forum for Information Resource Management (Strategic Planning meeting)
- National Association of State Auditors, Comptrollers and Treasurers (1997)
- New York State Institute on Mental Health Management Information (1997)
- CTG Project Proposals (1993-1996)

From the above sources, information technology issues or issues that have related information technology, management, or policy components were identified and placed in the following categories:

- **Programmatic Issues**
 - Economic Development & Commerce
 - Education
 - Health & Human Services
 - Environment & Natural Resources
 - Public Safety
- **Public Management Issues**
- **Inter-program/Inter-governmental/Cross-program Communication Issues**
- **Technology-Specific Issues**
 - Electronic Commerce
 - Internet
 - Expert Systems
 - Document Management System/Imaging
 - Geographic Information Systems
 - Data Warehouses, data marts, data mining

Information technology issues from a programmatic perspective

From a practitioner perspective IT-related issues, not surprisingly, most often present themselves in terms of specific government programs and operations. Following is a brief discussion of the IT issues in the context of these categories.

Economic development and commerce

Based on the preliminary analysis, several IT-related issues were identified in the area of economic development and commerce. These include:

- Taxing the Internet and online services

- Information flow between government and vendors of government goods and services
- Using IT to promote intra-state purchase of goods
- Telecommunications as an economic development tool
- Telecommunications law
- Increasing access to economic, demographic, and real property data to support economic development
- Using GIS to support the integration of environmental, real property, and economic data for economic development decision making
- Automating the provision of information about government regulations to businesses

Taxation of the Internet and online services was an agenda item for the 1997 National Conference of State Legislators. The National Association of Auditors, Comptrollers, and Treasurers focused on using IT to support transactions between government agencies and vendors for purchases of goods and services. A project submitted to CTG by the New York and New Jersey Port Authorities sought to develop a database to support the substitution of New York made products. The 1997 International City/County Management Association (ICMA) meeting agenda lists the US Federal Telecommunication Law as an issue of importance and further includes an item discussing telecommunications as an economic development tool. Two of the proposals to CTG focused on using technology to increase access to census, economic, and real property information to facilitate economic development decision-making while a third focused on the use of geographic information systems (GIS) to support the integration of environmental, economic, and real property information to balance economic development and environmental protection goals.

Education

IT tools can support education in different ways for different populations. IT can support the delivery of educational programs to remote locations and can facilitate asynchronous learning. It

can also reshape traditional classrooms. Following is a preliminary list of education-related IT issues:

- Telecommunications for medical education
- Tracking of training services
- Effective integration of technology, teaching, and learning in K-12 schools
- Telelearning

One of the proposals to CTG focused on the provision of medical educational services through the use of multi-media network services. Another proposal sought to use IT to facilitate the tracking of training services provided to staff. A third from twelve school districts seeks to study and improve the relationship between technology, teaching, and learning at the K-12 level by focusing on staff development models and school district technology policies.

Health & human services

Some of the most dramatic policy shifts involve IT are associated with changes in health and human services programs. Following is list of issues based on the preliminary research:

- Expert systems to support admission and treatment decisions
- Telemedicine
- Information access policies (genetic, adoption)
- Availability of information to support policy making
- Electronic benefits transfer
- Using IT to decrease instances of benefits fraud
- Using IT to determine service eligibility across programs

Welfare reform and the shift to Medicaid Managed Care will require substantial attention to information uses, flows, and policies. The Health Coverage Availability and Affordability Act of 1996 (commonly known as the Kennedy Kassebaum Bill) requires the Secretary of Health and Human Services to establish a unique identifier for each person, employer, health plan, and

provider in the health care system. Data interchange standards accredited by ANSI have been or are now being developed. These policies will in turn have significant implications in the development of systems to support health and human services program operations and evaluation. These programmatic shifts will also underscore the criticality of addressing information sharing across government agencies.

The use of telemedicine, as a mechanism for increasing access to care, particularly in rural areas, has been identified as important. As discussed above, telecommunications and multi-media have also been identified as technologies to support medical education and training.

Information access issues are critical in the area of health and human services. Individual health information is highly confidential and must be maintained and transferred in highly secure environments. For example, the National Conference of State Legislators discussed the issue of access to genetic information at their 1997 conference.

At their 1997 meeting, The American Public Welfare Association discussed the issue of using electronic benefits transfer to distribute benefits to food stamp recipients. The National Council of State Human Service Administrators also identified electronic benefits transfer as an important topic for discussion. A project proposal CTG received from the State Office for the Aging and the Office of Mental Retardation and Development Disabilities focused on the development of a computerized application process for the elderly and disabled that would support simultaneous eligibility determinations across a range of services. Another, from the Department of Health

sought to develop a screening and referral system for individuals with long-term functional impairments. An Office of Mental Health proposal involved the development of an expert system to support admission decisions in emergency rooms for persons presenting with psychiatric symptoms. A similar decision support system is discussed in the Medicaid Managed Care section below. The concept of developing distributed electronic databases of services and service providers was identified twice. The American Public Welfare Association/ISM meeting discussed the idea of a Virtual Human Services Pavilion and a proposal to CTG from a county BOCES focused on the development of a network to serve at-risk rural families through network-based online service referrals and information sharing.

Medicaid Managed Care

The shift from fee-for-service to managed care for Medicaid recipients represents a dramatic shift in the way that services are provided to the Medicaid eligible population and will further require a number of changes in the way that information is exchanged between providers of services, federal, state, and local government agencies, and managed care organizations. Additionally, appropriate information must be collected to support the evaluation of this programmatic change.

The following issues were identified based on the preliminary information:

- Expert systems to support service authorization
- EDI to support service authorizations
- Service utilization tracking
- Program evaluation & quality of care assessment
- Billing
- Electronic client records

One of the keynote speakers at the 1997 NYS Institute on Mental Health Management Information was entitled “Are we ready for electronic client records, communication, and

Managed Care?” another presentation at the conference focused on the “capitation” experience of mentally disabled Medicaid recipients in New York State. An expert system was also discussed that reduced by approximately 80 percent, the number of phone calls between a hospital emergency room and the managed care provider regarding service authorization for individuals presenting with psychiatric symptoms.

CTG is beginning a project that will focus primarily on the flow of information between providers of services and managed care organizations to support enrollment verification and service authorization.

Welfare Reform

Designing and implementing systems to meet the rapid changes in eligibility determination and service provision in the welfare system pose substantial information and management challenges to government agencies at federal, state, and local levels. Following is a preliminary list of IT issues related to welfare reform:

- Interstate information sharing to support eligibility determinations
- Electronic benefits transfer
- Measuring outcomes

An issue, discussed at the 1997 meeting of the National Council of State Legislators is that of tracking information across state lines in order to support eligibility determinations. The

American Public Welfare Association has also raised the issue of electronic benefits transfer.

Another critical information management issue relates to measuring outcomes in welfare reform

as indicated by the National Council of State Human Service Administrators and National Council of Local Public Welfare Administrators.

Environment & Natural Resources

CTG has over the past three years, also received several proposals for projects related to environmental conservation and natural resources. One proposal submitted by the NYS Department of Environmental Conservation, sought to use electronic data interchange (EDI) as a mechanism for sharing oil and gas regulatory data, while another submitted by NYS Environmental Facilities Corporation sought to develop an electronic bulletin board system to provide small business owners with information on environmental requirements.

Public Safety

Emergency management is also highly dependent upon an effective exchange of information about the emergency itself, and the characteristics of the area in which the emergency is occurring, including the characteristics of the population and structures at risk. In addition, information must be readily accessible about the availability, types, and location of various resources needed to contend with an emergency. Following is preliminary list of IT-related issues associated with public safety:

- Information infrastructure to support disaster preparedness and mitigation
- Network-based statewide communication to support emergency management
- Automating Pistol Permit Issuance

A proposal submitted to CTG by the New York State Division of Military & Naval Affairs sought to develop a statewide communications network with electronic mail and file transfer capabilities to support the agency's day-to-day operations and their ability to deal with emergency situations.

In addition to increasing the ability of agencies to communicate electronically to share information about emergencies as they are occurring, information and information technology can be used to identify potential for various types of emergencies and to estimate and mitigate their effects.

Criminal justice is another area of public safety that requires the effective use of information and information technology. CTG received a project proposal from the New York State Police that sought to develop an application to support the issuance of pistol permits electronically. The 1997 International City/County Management Association presented a session on violent crime.

Public management issues

Public management is also an obvious area that can be supported by information technology.

Following is a preliminary list of public management IT issues:

- Hiring, training, and maintaining a skilled IT workforce
- Financing IT
- Outsourcing or privatization of government information resource management functions
- Telecommuting

One of the issues that appears to be of critical importance to government practitioners is hiring, training, and maintaining a skilled IT workforce. *CIO* featured an article on finding the right people for Federal government CIO positions. A recent CTG project on state-local information systems highlighted this issue as well.

Another critical issue that governments are facing with respect to IT focuses on mechanisms for funding IT projects. *CIO* featured an article on shifting to an investment-oriented way of thinking about government IT spending. The Strategic Computing and Telecommunications in the Public Sector program at the Kennedy School of Government conducted a workshop on *Overcoming Budget Barriers: Funding Information Technology Projects in the Public Sector* that sought to identify the barriers to government IT funding and possible solutions for addressing these barriers.

Other public management IT issues are focused on using IT to support internal agency operations. For example, reengineering was a topic on the agenda for the American Public Welfare Association Information Systems Management 1997 Conference. A proposal to CTG from the New York State Office of the Comptroller sought to develop a Computer-Assisted Travel Audit Software and focused on reengineering and automating the travel audit process. Related to issues of reengineering are those associated with the use of IT to more effectively deliver services to citizens, a topic at the 1997 NASIRE conference.

While not necessarily discussed in the context of IT issues around performance measurement and activity-based costing were on the agendas of International City/County Management Association and the National Association of State Auditors, Comptrollers, and Treasurers respectively. These types of issues have implicit information management components in that information will have to be defined, collected, and used in different ways in order to more effectively evaluate program performance or more directly tie the costs of operations to the activities that support them. A proposal to CTG from the Tompkins County Department of Public Works in New York State is also related to evaluating public perception of the performance of government services. This proposal sought to investigate the use of kiosks to support computerized customer service surveys of government services.

The 1997 Conference of National Association of State Information Resource Executives (NASIRE) was highly focused on the management and dissemination of public information. Topics at the conference included public stewardship - managing the people's information, international perspectives on public stewardship, the role of government in public stewardship, and public information and dissemination (including issues of access and ethics). Another issue of interest addressed at the Annual Conference is privatization or outsourcing of government information resource management functions.

Telecommuting is an important issue of emerging importance for government practitioners. As the technology to facilitate telecommuting becomes more widely available and commonplace, more and more government employees may be working from home or other remote locations, at

least part of the time. This option may require that policies and procedures be in place to support telecommuting and may also require that different mechanisms for performance evaluation be developed. A proposal to CTG from the New York State Energy Office sought to evaluate the potential for Telecommuting at that agency as well as several others.

Inter-program/inter-governmental/cross-sector communication issues

While many of the issues listed above fall within the arena of specific government programs and therefore can be addressed within the context of the program areas, many of the problems facing government agencies involve the exchange of information across levels of government, different programs within government agencies, or between government agencies. For example, of the 36 proposals, submitted to CTG by New York State government agencies, 29 or over 80 percent involved service or communications opportunities crossing multiple agencies. Eighteen of the proposals focused on technology that would facilitate information flows across levels of government, 13 focused on improving communication flows between government agencies and non-government contracted service providers, and a total of 11 involved the communication between government agencies and citizens.

The uses of IT in government and therefore the issues of importance to program and information resource managers relate to all aspects of information flow: internal agency information flows, flows between government agencies and across levels of government, flows between agencies and citizens, the private and non-profit sectors. These types of cross-agency or cross-governmental IT projects are often the most difficult to design and implement effectively as there are often multiple stakeholders with different priorities and goals. Addressing these issues

requires a robust communications infrastructure as well as coordination and cooperation across the boundaries of government.

In addition to those found in the CTG project database, a number of inter-program or inter-governmental information issues were identified from the other sources. Following is a list of cross-program/cross-government issues based on the preliminary findings:

- Cross-agency information integration
- Development of infrastructure and policies to support data and application sharing
- State infrastructure banks
- Data matching across agencies and programs
- Inter-relatedness of programs and information systems in the context of welfare reform
- Online systems to support eligibility determinations across programs
- Public-private partnerships
- Partnerships for education between local government, schools, and business

The New York State Forum for Information Resource Management's annual meeting featured an agenda item on integration of information across agencies as well as an item on the development of key infrastructure and policies to support data and application sharing. The July issue of CIO Magazine featured an article on building and supporting government-wide IT infrastructure while the 1997 National Association of State Auditors, Comptrollers and Treasurers conference discussed state infrastructure banks.

Several of the cross-agency or cross-program issues focus on the matching of data across agencies or programs. For example, the National Council of Human Service Administrators and Local Public Welfare Administrators presented conference sessions on the matching of prisoner and food stamp information in order to prevent the issuance of food stamps to individuals who

are incarcerated. The same conference also featured a session on data matching to support child support collection as well as a session on Social Security Administration data exchange.

As discussed above, the changing environment in health and human services, will require more effective communication between programs and levels of government. The American Public Welfare Association's 1997 conference featured a presentation on the Inter-relatedness of programs and information systems in the context of welfare reform. Two additional presentations at the same conference focused on using IT technology to support eligibility determinations. One of the presentations focused on online systems for eligibility determination across programs while the other considered master client information systems to support eligibility determinations across programs.

Some of the issues raised by practitioners focus on the barriers to and benefits of partnering in IT projects. For example, The National Association of State Legislators' 1997 agenda featured a presentation on cooperative project development while the International City/County Management Association's 1997 conference featured presentations on public-private partnerships and partnerships for education between local government, schools, and business.

Technology-specific issues

The issues of concern to practitioners can also be classified according to specific technologies. Following is a brief discussion of government IT issues related to specific emerging IT tools.

Electronic Commerce

The policy, management and technology issues associated with electronic commerce are many and complex and will have a substantial effect on government agencies, businesses, and citizens. Like the other technologies listed here, electronic commerce offers substantial opportunity for governments and businesses to change the way they do business with one another and with their customers. Electronic commerce, in particular the topic of electronic signatures, was on the 1997 agenda for the National Conference of State Legislators. Electronic commerce, barriers, and lessons learned was an agenda item at the 1997 conference of the National Association of State Information Resource Executives.

Internet and WWW

The Internet and the WWW offer perhaps the most significant utility in terms of changing the way that government organizations collect, use, and share information with citizens and other private and government organizations. Not surprisingly, however, the effective use of these technologies requires that a substantial number of new policy and management issues be addressed. Following is a preliminary list of issues associated with the Internet and World Wide Web:

- Developing effective Web sites
- Security
- Privacy, confidentiality, and access to personal information

Security of government Web sites is clearly an important issue. There are already a number of government Web sites that have been hacked and had their contents and links changed rather radically. For example, the CIA, the Justice Department, and the Air Force web sites were recently broken into.

A report issued by OMB Watch, a non-profit organization concerned with the federal government's responsiveness to the public needs and those of charities, entitled *A Delicate Balance: The Privacy and Access Practices of Federal Government World Wide Web Sites*, discussed the Social Security Administration's Personal Earnings Benefit Estimate Statement (PEBES). This system which allowed users to both request and view their statements using the World Wide Web, was widely criticized in the press for failing to protect privacy and the services were subsequently suspended until an independent panel of computer and privacy experts can determine if additional safeguards are needed to protect the confidentiality of Social Security records.

The same report by OMB Watch presented the results of a survey of 70 federal agency Web sites. One of the conclusions based upon the survey data was that the development of a government-wide policy on balancing public access and personal privacy through services was critical.

Expert Systems

The development and use of expert systems is also a topic of interest for government practitioners. Expert systems can be used to support decision making and operations across many government programs. CTG received a proposal and completed a project that developed, implemented and evaluated expert judgment technology to support psychiatric assessments in emergency rooms. A similar system being used to minimize information flows between a hospital's psychiatric emergency room and the managed care organization responsible for the

oversight of behavioral health services for many of the ER's clients was discussed at the 1997 Institute on Mental Health Management Information.

Document Management Systems

Imaging and document management systems have also been identified as important emerging technologies. A project proposal submitted to CTG by the Port Authorities of New York and New Jersey sought to develop and evaluate an electronic document management system for lease management and revenue accounting functions. Another project conducted by CTG with the New York State Department of Motor Vehicles evaluated the use of imaging technology to support the Department's vehicle title process. A project conducted by CTG with the New York State Adirondack Park Agency focused on the integration of GIS and document management in a current project with the same agency is developing a tool to support the identification and implementation of mechanisms to electronic records management issues associated with GIS, document management, and workflow technologies in a networked environment.

Geographic Information Systems (GIS)

It has been estimated that approximately 80 percent of all government information has a spatial component. Geographic information systems allow for the integration of various layers of spatial data as well as a number of analytical and presentation capabilities. As with most technologies, the implementation of geographic information systems, in particular the development and sharing of digital spatial data raises substantial issues with respect to information management and policy. Digital spatial data development and maintenance can be very costly and further offers substantial utility to public and private sector organizations. As a result, many governments are grappling with information access issues associated with GIS and digital spatial data. Some

states have passed legislation that exempts digital spatial data from Freedom of Information laws and some are allowing for the sale of this data to private sector organizations. At the federal level, efforts toward the development of a National Spatial Data Infrastructure are underway and activities such as the development and testing of meta data standards for digital spatial data are also being undertaken.

To date, CTG has completed two projects associated with GIS and digital spatial data and another is currently underway. The first of these focused on integrating GIS and document management capabilities to support the land-use permitting process in the New York State Adirondack Park. The second focuses on the development of a New York State GIS Cooperative to support the sharing of digital spatial data, and the development of statewide policies to support the development and dissemination of this data. CTG's current project is focusing on records management issues associated with the management of electronic records comprised of documents and information in a diversity of formats, including digital spatial data formats. An additional proposal from the New York State Department of Health sought to develop a GIS to provide health care planners and policy makers with data on populations, health care needs, and the locations of service providers, as well as the analytical capabilities to assess levels of access to care.

Data Warehouses, Data Marts, Data Mining

Data warehouses have also been identified as an important emerging technology for use in government. The National Association of Auditors, Comptrollers, and Treasurers had the topic Beyond the Data Warehouse, and other development in IT on their 1997 conference agenda while

the National Council of Human Service Administrators and National Council of Local Public Welfare Administrators discussed using data warehouses for tracking outcomes and performance at their 1997 conference. CTG has recently begun start-up activities for a series of Data Management Testbeds that will focus on data warehousing, data mining, decision support and other mechanisms for increasing access to and utility of government information.

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