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Public Sector: Early Stage of a Deep Transformation

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AMERICAN GOVERNMENT IS in the early stages of deep transformation as a result of the Internet and a host of related developments in information and communications technologies. Rapid growth of web-based applications in the government sector promises significant cost savings through structural changes in the production and delivery of government information and services. Deeper organizational and institutional restructuring in government is likely to generate further efficiency gains. But cost savings that result from institutional and organizational transformation are more difficult to calculate because savings due to technology cannot be disaggregated from those due to structural modification. Furthermore, it is in the nature of a revolution that some future developments remain unpredictable as entirely new and unanticipated innovations and interactions emerge.

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This chapter parses the transformation of the government sector into early-stage innovations in boundary-spanning functions that produce efficiency gains in information provision and service delivery and later-stage, deeper, transformation of internal government agency and cross-agency structures and processes. It also distinguishes between the quantifiable cost savings to government of web-based service delivery systems versus the less readily quantifiable benefits to corporate and private citizens that come from doing business with government over the net. Annualized cost savings to the government sector of as much as $12 billion provide a rough but conservative estimate of near-term efficiency gains. Yet serious structural, institutional, and political obstacles may cause the actual savings to fall short of purely economic estimations. Challenges for government include lack of funding for information infrastructure development, uncertainty about the rate of penetration of Internet use in society, privacy and security concerns, bureaucratic politics, insufficient technical expertise in government, and unresolved practical and normative issues regarding the appropriate roles of the public and private sectors in the development and management of digital government.

Government, more than any other sector in the economy, is characterized by information processing coupled with relational and operational complexity. The sector is the largest purchaser of goods and services and comprises arguably the largest and most arcane set of organizations and relationships within the U.S. economy. Its monopoly position further complicates comparison with other sectors. Moreover, government is the only sector required to enforce laws and regulations and to deliver information and services to 100 percent of the nation's population and firms. Finally, the normative dimensions of these relationships further differentiate government strategy, decisionmaking, and behavior from those features in other economic sectors.

In government operations, as in any other sector, the value chain generates relationships that, from a systemic point of view, can be classified in three ways: relationships between the government and its suppliers; those between government and individual citizens and businesses; and those that lie within and among the government's subsystems.[1] In this chapter, these categories are defined as government-to-business (G2B) to denote procurement activities, government-to-citizens (G2C) to refer to transactions

1. In this chapter the sharing or exchange of information or resources among public agencies is considered to be a G2G relationship.

between government and individuals or corporations, and government-to-government (G2G) to delineate interagency or intergovernmental linkages.

This chapter examines the current use and impact of the Internet on government as well as developments anticipated during the next decade. It summarizes key impacts of information technology (IT) on government structure, capacity, and operations; examines leading uses of the Internet at several levels of government, noting not only cost savings but transformation of service delivery and internal structure; and presents a set of estimates for Internet penetration and cost savings in the G2C and G2B categories. The chapter then details the importance of managerial, political, and organizational arrangements for the development of e-government. The report concludes by raising emergent and critical policy issues that will become more pressing during the next decade.

The Impact of Information and Communication Technologies

The economic impact of the Internet on government is potentially enormous yet poorly understood. Major economic effects may be classified into three categories: lower transaction costs; gains in efficiency as a result of increasing positive network externalities; and new strategic and operational possibilities enabled by the Internet. The organizational use of electronic mail alone is reported by Ferris Research to generate an average annual savings of $9,000 per typical office worker, or productivity gains of 15 percent.[2] The report focused on the quantifiable benefits of substituting e-mail for drafting and producing letters, sorting and answering paper-based mail, preparing and faxing documents, filing paper, and trying to reach people by telephone. The study found that an office worker saves, on average, 381 hours a year by using e-mail. Loss of productive time due to e-mail was estimated to be 115 hours a worker. Nie and Erbring report that "90 percent of all Internet users claim to be e-mailers."[3] Given the labor intensiveness of preparing paper-based correspondence and memos, the estimated productivity gain seems reasonable.

Some of the most dramatic examples of reductions in transaction costs, the first category, are found in the differences in cost between web-based

2. Leslie Schroeder, "Ferris Research Shows That Company Policies on Email Use Can Measurably Improve Staff Productivity." Ferris Research Press Release, January 18, 2000 (www.ferris.com/pub/FR-109.html).

3. Nie and Erbring (2000, p. 5).

Table 8-1. *Cost of Processing Bills, on Paper and Online*

Cost	*Traditional*	*Online*
To biller	$1.65–$2.70	$0.60–$1.00
To customer	$0.42	$0
To bank	$0.15–$0.20	$0.05–$0.10

Source: Secretariat on Electronic Commerce (1998, table 6, p. A4-36).

and traditional methods of bill payment and document submission. Caveats with respect to estimates of savings are important. Projected savings vary widely in terms of the estimates themselves as well as the variables used for analysis. For example, few analysts consider the costs of infrastructure development, integration of cross-boundary transactions with other internal processes, or upgrades when estimating savings, omissions that lead to upward bias in results. Firms that sell web-based transaction services typically generate and publicize cost savings figures. Detached, rigorous analysis of generalizable samples of transactions remains rare. According to EzGov.com, a major producer and vendor of e-government software and services, online bill payment is 67.2 to 95.6 percent more efficient than paper-based operations.[4] The U.S. Department of Commerce, however, estimates that the cost to the government of processing a payment would be reduced from $1.65–$2.70 for traditional processing to $0.60–$1.00 for web-based processing (table 8-1).[5] Hundreds of millions of paper-based transactions are conducted, in the form of bill payments or document submissions, that involve public agencies to which similar types of efficiencies can be applied.

In addition to transaction costs savings, positive network externalities associated with Internet penetration increase the estimated savings from the use of e-mail. In other words, the larger the network of e-mail users, the greater the benefits of using e-mail because e-mail may be substituted for other forms of communication to a greater extent than would be possible if the network of users was smaller. Each additional person online generates a positive network benefit to those who are already online not only because

4. Data are from a figure titled "EZGov research: e-government cost savings," and from EZGov, "E-Government: Making Sense of a Revolution," an advertising supplement. Figure and supplement e-mailed to the authors by Nicole Corvette, EZGov.com, August 29, 2000.

5. Secretariat on Electronic Commerce (1998, table 6, p. A4-36).

of reductions in transaction costs, but also through the scalability of web-based communication.

One of the more dramatic current examples of the third category, new strategic opportunities, lies in potential efficiencies achieved by the use of multiple "exchanges." These exchanges significantly improve the efficiency of procurement for some types of goods and services through the creation of wider, deeper, and more transparent markets that allow government agencies both to reduce administrative costs and to obtain lower prices in markets.

Infrastructure is a limiting factor in the development of e-government. The speed at which information can be transferred affects the cost savings of transactions that are time sensitive. Transaction time affects reliability of transmissions as well as the feasibility of e-government use by the public. For example, the transfer of a ten megabyte file, roughly equal to the contents of six or seven floppy disks, varies from eight seconds to forty-six minutes depending upon the sophistication of the connection. The impact of information and communication technologies in terms of time and cost is significant for procedures and functions that require sharing information or validation of data. In principal, the Internet makes it possible to transfer enormous amounts of data in seconds, saving time and money. But the ability to realize these cost savings depends on the type of technology acquired by public agencies to connect to the Internet; their policies regarding information, data sharing, and transfer; and a number of emergent security and privacy issues. With regard to the latter, security is positively correlated with transmission speed.[6]

Funding for information infrastructure that enables efficiency gains, reliability, and required levels of security is currently a serious impediment to the development of electronic government. The results of a survey of county-level governments, for example, indicate that funding represents the chief obstacle to e-government.[7] Funding is likely to be more difficult to obtain in some county governments as well as in relatively poorer state, city, and town governments. Nearly half the state governments in the United States voted in referendums between 1978 and the mid-1980s to support tax and expenditure limitation measures, most of which remain in

6. Two recent reports from the U.S. General Accounting Office (2000 a, b) detail problems with security and privacy on federal government websites.

7. National Association of Counties. 2000. "E-Government Survey" at (www.naco.org/pubs/surveys/it/2000egov.pdf [August 27, 2000]).

effect and limit the ability of local governments to raise taxes.[8] Wealthier states and the federal government are expected, therefore, to develop information infrastructure first, with other governments following. Yet even at the state and federal levels, significant variation in infrastructure within state and federal agencies and across state governments will lead not only to heterogeneity of adoption and development, but also to lack of interoperability across units and levels. Thus, fragmentation in infrastructure limits efficiencies that flow from positive network externalities.

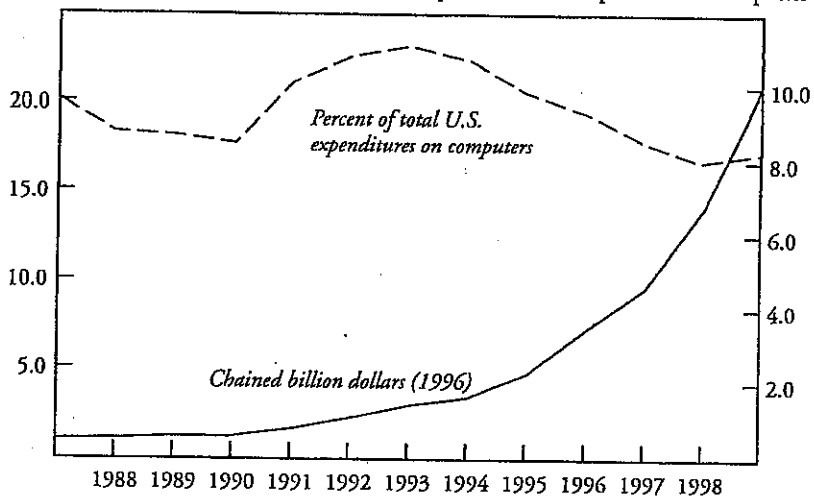
Infrastructure for e-government must provide security as well as transaction speed. Faster communication technologies would help solve security problems raised by web-based transactions but at a cost to governments. Governments have invested in security primarily through the use of secure web servers that protect data and information "on site." It is also necessary to ensure data security during transfer. At the county level of government, the results of a survey conducted by the National Association of Counties indicate that 85 percent of counties that responded to the survey provide at least one employee with access to personal computers. Only 50 percent of counties report that at least one employee has access to e-mail; 54 percent of counties report that none of their employees have access to the Internet. Among those counties with Internet access, 84 percent reported that they connect to the Internet using a dial-up modem, the slowest form of connection available. Note that the response rate of the survey was only 23 percent, with the majority of respondents from small counties in the midwestern, southern, and western United States.[9] Levels and types of connectivity may be proxies for the status of infrastructure to support e-government. In sum, any discussion of the cost savings of electronic government must account for the extent and cost of the national information infrastructure development necessary to support web-based transactions.

Government functions are information intensive. Thus, it is not surprising that public administration possesses one of the highest rates of computer use at work. As a result of the explosive growth of e-commerce since 1995, government expenditures for computers have been decreasing as a percentage of total U.S. expenditures for computers (figure 8-1). The

8. California was the first state to vote in a tax and expenditure measure, Proposition 13, in 1978. Massachusetts followed with a referendum to approve Proposition 2 1/2 in 1980. See Susskind and Fountain Serio (1983).

9. National Association of Counties. 2000. "2000 E-Government Survey" at (www.naco.org/pubs/surveys/it/2000egov.pdf [August 27, 2000]).

Figure 8-1. *U.S. Government Expenditures on Computers, 1987–99*



Source: Bureau of Economic Analysis, U.S. Department of Commerce (www.bea.doc.gov/bea/dn/comp_gdp.exe [June 29, 2000]).

number of public sector domains has increased at a rapid rate, beginning with about fifty domains in 1995 and approaching eight hundred in 1999. The growth rate from 1998 to 1999 alone was 38 percent. In contrast to the private sector, the number of web and file transfer protocol (FTP) servers in the federal government is high relative to the number of domains. In 1999 the federal government had twenty-six web servers, twenty-two secure web servers, and twenty-eight FTP servers per domain.[10] However, these figures for government growth contrast sharply with the growth of "dot.coms" in the private sector whose number grew by 280 percent during the same period.[11] Given the numbers of government servers, larger government units in the public sector already possess at least the minimum technological infrastructure needed to adopt Internet-based applications.

10. U.S. General Services Administration (1999).

11. Matthew Zook, Department of City and Regional Planning, University of California at Berkeley (www.socrates.berkeley.edu/~zook/domain_names/Domains/Coms_by_states.xls [February 27, 2001].

The cost savings of e-government also depend upon penetration, or growth, of Internet usage by the public. Specifically, savings will vary according to the rate and level of penetration of web-based transactions in the population and in private sector firms. It is not currently known how rapidly individual citizens will adopt e-government, which means that a key variable needed for the calculation of cost savings is unknown. For the foreseeable future, then, governments must maintain capacity for traditional operations and transactions. It is well documented that the adoption of the Internet varies greatly as a function of ethnicity, race, age, income level, and distance from major business, technological, and decisionmaking areas. These characteristics vary in part by geographic region. For example, slightly more than 50 percent of the adult populations in cities such as Washington, San Francisco, Austin, and Seattle/Tacoma currently use the Internet, whereas 30 percent or less of the populations in cities such as Pittsburgh, Tulsa, Birmingham, and Charleston/Huntington, West Virginia, are Internet users.[12] Disparities in rates of Internet use are likely to be correlated with socioeconomic variables in less densely populated areas as well.

An increasing number of public sector units at the federal, state, and local levels are incorporating or planning web-based government transactions. The focus in governments at all levels on G2C features reflects a desire to increase "customer service" that has been predominant since the mid-1980s. Although G2C features are of strategic importance, governments have done little to market web-based services to the public. Government marketing might alienate citizens without Internet access. It also risks creating demand that cannot yet be met. But this situation may be changing. The results of a survey of state information resource executives indicate that a number of state governments have begun to take measures to motivate their constituents to use e-government features.[13]

Federal, State, and Local Innovators in E-Government

Several governments currently deploy first generation web-based services that allow citizens, businesses, and other governments to transact with a

12. Cyberatlas.com, "Five U.S. Cities Reach 50 Percent Internet Penetration," *The Big Picture: Demographics,* October 18, 1999, p. 1 (www.cyberatlas.internet.com/big_picture/demographics/article/0,1323,5911_220481,00.html [February 23, 2001]).

13. National Association of State Information Resource Executives. 1999. "Information Security in State Government Information Technology" (www.nasire.org/publications/99IFR.pdf [May 30, 2001]).

government agency over the web.[14] The electronic government applications available at the federal, state, and local levels vary widely with respect to interactivity, complexity, and convenience. Current initiatives fall into two broadly defined categories. Whereas some agencies and governments have assumed lead roles in offering a large number of electronic government services to citizens and business, others have focused on creating a web-based environment designed to facilitate search and use of existing services and information. A small but growing number of governments attempt to do both and have created portals, or "one-stop shops," for interaction with government.

When governments provide electronic services online, they save money by generating less paperwork, decreasing time and effort expended by employees to process routine transactions, and lowering error rates. Governments may field fewer inquiries for routine information and instructions for completion of routine tasks. Citizens and business save on the costs of compliance including search costs, travel costs (including time waiting in line), repetitive entry of information, verification of task completion, and notification of errors during the transaction. Users benefit from reduced search costs involved with locating the correct agency or agencies for their task and from having to spend less time filling out forms with replicated information.

E-government "best practice" examples consistently strive to increase responsiveness to clients by eliminating process steps, redundancy, and confusion for the user. Washington State, for example, employs an enterprise strategy to coordinate the web-based activities of agencies, offices, and departments within its portal. State government portals are currently designed to target segments of the population that can be grouped demographically (such as senior citizens), geographically (such as residents of a particular region), or vocationally (such as state employees, other employees, employers, and businesses). Portals that target specific population segments contain interfaces to the online services of interest to those populations, regardless of agency. In the best cases, portal development would lead to reasonably well-integrated web design standards and back-end systems coordinated across agencies to facilitate completion of transactions on agency web servers. Some designers believe the user does not need to know before or even during a transaction which agency web server he or she must

14. Internet-based innovations in federal, state, and local government are presented in greater detail in Fountain (2001a).

access to accomplish a task, but rather need only know the web address of the government portal where the needed functions are located.

The portal model is designed to reduce or eliminate redundancy and confusion in transactions with government. However, these gateways to electronic government are ultimately dependent upon the existence, availability, and quality of information and transaction-based services within agencies. In other words, the limiting factor on portal quality is information and service quality at the agency level. The usefulness of a portal is directly dependent upon the number and quality of government services offered online. The corollary is also true: decreasing the cost of access to existing services through a well-designed portal increases the usefulness of the services. Ultimately, portals will reflect the autonomy and lack of integration of the agencies behind the virtual interface. The technical logic of government by portal demands that the integration and seamlessness presented on the web be reflected by structural changes that would transform business processes and relationships within and across agencies.

Lack of coherence in government web portals reflects inconsistent standards of security and privacy; differing levels of service, transparency, and documentation; and redundancy of information and data requirements. Solving the problems of agency-specific "stovepipe" applications has been slowed by bureaucratic politics, siloed oversight and budgetary systems, and security and privacy constraints. With respect to the latter, agency and program officials are rightly concerned about—and currently lack adequate safeguards for—storing and managing information from and about private citizens or businesses in centralized interagency databases.

Washington State has developed a "Digital Government Plan" that describes in depth a framework and vision for state electronic government in a five- to ten-year time frame. The plan includes guidelines for developing e-government applications and incentives for successful implementation of e-government services. The state has developed a set of standards including uniform web design guidelines and back-end protocols to guide process redesign at the agency level. Washington's comprehensive approach sets the state apart from the modal state government website or portal in which services online accrete according to the initiative and entrepreneurship of public managers. Executive level leadership in Washington State not only guides the development of web-based capacity, but also leads inexorably to greater rationalization and standardization across agencies and programs.

Following are examples of innovative web-based applications of e-government at the federal, state, and local levels of government. The examples were selected on the bases of a review of the current research and empirical data regarding e-government and of several rewards programs that identify lead actors in the development of web-based services. State-level findings are based on a comprehensive examination of all state government websites. Thus, these illustrations are outliers in the statistical sense and represent developments in government that may take decades to become central tendencies. Most writing on digital government underestimates how long it might take for the rest of the population to move online with Internet connections that would allow interactivity at a speed that would make digital government feasible. Moreover, problems of access and income are compounded by those of literacy.

Proponents of digital government also tend to discount the current inability of many local governments to offer web-based transactions to the public, given their lack of budget, infrastructure, and expertise. Nearly a decade passed between the development of the first web browser, Mosaic, and dramatic growth in e-commerce. Longer lags in the public sector are likely.

Federal E-Government Innovators

The federal government's efforts over the past decade to put government information on the web, prompted by the Paperwork Reduction Act of 1995 and other legislative mandates, have been energetic, with volumes of information now available to the public through government agency websites. Despite achievement on this front, however, efforts to develop online functionality and transaction-based services to complement the availability of information have lagged behind the private sector.

Recent initiatives have begun to change this state. Spurred in part by the impressive success of e-commerce in the private sector, the Clinton administration committed to placing key government services on the Internet. The National Performance Review (later renamed the National Partnership for Reinventing Government) was established in 1993 with the call of "putting customers first" and striving for a "customer-driven government that matches or exceeds the best service available in the private sector."[15]

15. Executive Order 12862, "Setting Customer Service Standards, September 11, 1993. See (www.customersurvey.gov).

One of the key metrics of a best practice e-government initiative is the degree to which it offers one-stop customer service, allowing all of a customer's business to be completed in a single instance. Two efforts within the Access America project, sponsored by the National Performance Review, focused on building one-stop shops for citizens: the www.students.gov and the www.seniors.gov portals.[16]

STUDENTS.GOV. Access America for Students is a portal site of government resources—including a collection of links to various government websites, forms, and programs—of interest to students. It provides a searchable database of links to relevant government or nongovernment sites with descriptions and ratings of each site. By registering on the site, students can participate in the "Grade-A-Site" feature and contribute to the site ratings themselves.

The portal layout familiar to most Internet users makes finding tools or information related to a specific topic relatively easy. The search engine also facilitates information acquisition. Additionally, all major interactive features of the site are grouped together on the home page under "Fast Links," which allow students to jump directly to the service they need. Application for federal student financial aid is more convenient, responsive, and error free on the web. A link exists to the Department of Education website that contains the Free Application for Federal Student Aid (FAFSA). A PIN (personal identification number), used as an electronic signature, is assigned to an individual upon registration. The online version of the FAFSA allows an applicant to save a partially completed application form to a hard drive or diskette and then continue the application process at a later time by reloading the saved file. The site also provides extensive documentation and help.

The economic payoff from this process is significant. Tens of thousands of students have applied for student financial aid online since its launch in June of 1997. Completing the FAFSA online is easier and less time consuming in part because the software automatically selects the appropriate questions and checks responses on submission for completeness and consistency, eliminating delays and rework caused by the 10 percent of paper applications returned because of errors or incompleteness.[17] Currently, one step in the FAFSA process still requires the applicant to mail in a signed

16. Bureaucratic and institutional challenges in the development of the first federal portal, the U.S. Business Advisor, are analyzed in Fountain (2001c).

17. Correspondence with Dick Griffin, National Performance Review, June 23, 2000.

paper document. Once the document is logged, an electronic FAFSA takes only seventy-two hours to process, in contrast to fourteen days (not including mail time) for the paper version of the process.[18] Beginning in 2001 digital signatures will allow the entire transaction to take place over the web.

The Department of Education also uses the web to integrate service provision in part by expanding the range of transactions for which an individual's PIN can be used to access account and personal information. Access to the department's Central Processing System (CPS) database, access to Title IV student aid (currently limited to Access America pilot schools), and Student Account Manager reports—web-based reports on student loan origination and aid disbursement to schools (also limited to Access America pilot schools)—are all currently supported. Great potential exists in this area. The department currently pays a contract fee of $12 per 800-access telephone call to consult student account information. Web-based queries to the CPS data system cost a few cents. With approximately 20 million student loan accounts in service, the cost savings of moving a large number of these transactions to the web are tremendous.[19]

SENIORS.GOV. Access America for Seniors, at www.seniors.gov, is a portal to resources on the web for senior citizens. The home page features news articles of interest to senior citizens. A special feature, "Seniors and Computing," provides links to help seniors learn to use technology in ways that can benefit them. Ten topical categories, organized similarly, each include a list of links to and detailed descriptions of federal and state government agencies, commercial firms, and nonprofit organizations with resources for seniors. For example, the "benefits" section of Access America for Seniors links to resources and information concerning Social Security, railroad retirement benefits, veterans benefits, food stamps, retirement benefits for federal employees, and health care, including Medicare, Medicaid, and the Veterans Health Administration. A drop-down list linking the user to the veterans' affairs agency of each state provides access to state and local level resources.

Seniors.gov also includes online services, downloadable government forms, and several online applications. The "Services" category links to and describes twenty e-government applications relevant to seniors. The "Retirement Planner" category also links to a number of online applications

18. Access America, "A01: Improve the Public's Access to Government Services," at (www.accessamerica.gov/docs/public2.html [June 2000]).

19. Telephone interview with David Temoshok, General Services Administration, June 23, 2000.

including retirement resources regarding financial, medical, life insurance, and housing topics. For example, the "Financial Planning" subcategory links to sites with dynamic cost calculators to help citizens develop financial projections based on user inputs and assumptions. The "Medical" subcategory allows users to compare Medicare and Medigap health care plans available in their geographic area on multiple criteria including costs and benefits covered and several other measures of quality. Cost savings to the public of these types of services are likely to be significant, although difficult to estimate in advance, and include reduced search costs and improvements in analytical tools available to the public.

SOCIAL SECURITY ADMINISTRATION. The Social Security Administration (SSA) website is not an interagency enterprise portal but a strong example of a large, vital government agency's leading efforts to develop superior e-government capacity and service. The SSA provides services to current and future recipients of Social Security benefits. Its customer service record has been favorably compared with the highest-rated service firms, including Disney and L.L. Bean, in "courtesy, responsiveness, and knowledge."[20] The agency is committed to a similar standard of service excellence on the web. The SSA offers an online retirement planner that employs user-supplied parameters and financial information to estimate future benefits payments. The SSA's most frequently demanded service, the "Social Security Statement Request," can be ordered online and received by mail in two to four weeks.[21] The entire business process for this service will be conducted online in the future with the benefit statement returned over the web in seconds after a request. Online administration will save SSA more than a dollar for each statement issued.[22]

INTERNAL REVENUE SERVICE. The Internal Revenue Service has developed an e-government strategy to allow citizens to file taxes online without the potentially huge costs of developing the service internally. The private market for offline tax return software is strong, and the IRS has allowed vendors to harness commercial products with online capabilities through the "e-file" program. Several commercial software packages, a few of which are entirely web-based, allow users to submit tax return information to the IRS electronically. For most users, a paper form with a signature stating that the user filed his return electronically must be mailed in; however, the IRS is piloting an authentication process to enable an entirely paperless return with a digital signature.[23] The IRS acknowledges acceptance of an electronic return within forty-eight hours.[24] Direct deposit of tax refunds into a user's bank account is available for electronic returns. The early results of the e-file program indicate an error rate for electronic returns of less than 1 percent, compared with 20 percent for traditional returns.

20. Ken Apfel, "Social Security—World Class Customer Service," *Reinventing Government to Get Results Americans Care About,* at (www.npr.gov/library/announc/customer.html [June 2000]).

21. (www.ssa.gov/top10.html).

22. Associate Commissioner for Program Support, Social Security Administration, "Internet PEBES Request Services," January 22, 1997.

Innovation in E-Government at the State Level

State governments typically lead other levels of government in innovation. Often, reform begins at the state level and diffuses to federal and local governments. For this reason, Fountain undertook a comprehensive examination of state government websites to determine the types of services migrating to the web. Results indicate that electronic government services vary widely from state to state.[25] Several services are common to a number of states. A few states offer features that are unusual, innovative, and powerful. The mean number of electronic services offered by state governments in 2000 was 4.38, with a median of 4. A few states offer a significantly greater number of services. Although the number of services offered is not the only criterion for comparing the development of electronic government, the frequencies provide clear evidence of strong variance among states in number and type of services offered.

The most frequently offered service, state employment postings, is available on thirty-two state government websites, which also allow citizens to find and apply for state government jobs online. The second most common service, personal income tax e-filing, was found in twenty-four states that provide links to online filing applications. The prevalence of tax e-filing did not result simply because citizens demanded it, but because state governments can easily implement a low-cost, outsourced solution through the IRS e-file program. Other frequently occurring services allow members of the public to order vital records (birth, death, and marriage certificates) online (thirteen states), purchase fish and game licenses and

23. Internal Revenue Service, "Filing Season 2000 PIN Piloting Information for Taxpayers," (www.irs.ustreas.gov/prod/elec_svs/sig-txpyr.html).

24. Internal Revenue Service, "IRS E-File for Taxpayers Using a Personal Computer" (www.irs.ustreas.gov/prod/elec_svs/ol-txpyr.html).

25. Details of this study are presented in Fountain (2001a).

permits over the web (fifteen states), search state government sex offender registries (fourteen states), and renew motor vehicle registrations (seventeen states).[26] No other web-based application was found on more than 20 percent of state government websites.

A small number of innovative services, although present on only a few state sites, warrant attention and are noted in table 8-2. Access Washington (www.access.wa.gov) is currently the leading state government web portal. Georgia and a small number of other states offer a greater number of online services than does Washington. Georgia's state web strategy illustrates an innovative, but less integrated, approach to e-government than the strategy pursued by Washington. Other states have taken the lead in the design and customization of their sites. North Carolina and Virginia have advanced beyond a simple state portal model to create more powerful interfaces. No dominant state government templates have yet emerged. Selected key features presented in the table suggest the range, scope, and utility of first-stage, web-based government services.

Local Level E-Government Innovation

City, county, and town governments vary strongly in the socioeconomic characteristics of the citizenry, services offered, and nature of the interactions required. Electronic government, therefore, can be applied in a wide variety of ways with different impacts at the local level. City governments can ease the burden on busy agencies. Rural and county governments covering large geographical areas can decrease costs associated with geographic distribution that include not only travel time, but availability of transportation and the infeasibility of repeat visits to government offices.

Indianapolis, Indiana, is, according to many, the most impressive example of municipal government on the web and the recipient of several awards.[27] (Some of its innovative applications are listed in table 8-2.)

26. Vital records ordering is available primarily through vitalchek.com, a private third-party provider of online ordering for these types of records. Regarding fish and game licenses, North Dakota is unique in its implementation of this service by allowing licenses to be printed immediately from a web browser rather than delivered by mail. Motor vehicle registration renewal is one of several online services related to motor vehicles including driver license renewal or replacement, payment of citations, and order processing for personalized license plates. Motor vehicle registration renewal is one of the fastest growing services, with several states claiming to have the service "coming soon" on government websites.

27. Winner of the 1998 Global Information Infrastructure Government Category Award and cited by ZDNet Inter@ctive Week and the *New York Times* as one of the most powerful and useful municipal e-government sites, IndyGov offers a wealth of services to citizens. See www.indygov.org/winner.htm. ZDNet Inter@ctive Week, September 13, 1999; David M. Herszenhorn, "For the People, by the Computer," *New York Times*, September 30, 1999.

Table 8-2. *Selected Innovations in E-Government Services*

Access Washington (www.access.wa.gov)	State government web portal offering: technology procurement for state and local agencies; fraud reporting system; business and excise tax filing; criminal records search; unedited coverage of state government deliberations and events; vital records ordering; unemployment insurance benefits filing.
Washington State Enterprise Budget and Allotment Support System (BASS)	Internal agency budget development and monitoring tools. Reduces response time for budget proposals by 50 percent.
State of Georgia	Georgia Net (www.ganet.org): renew professional licenses; www.permit.com: purchase hunting and fishing licenses and boat registrations; TeachGeorgia.org: teacher recruitment site for Georgia public schools; students pay state university tuition online by credit card.
North Carolina (www.ncgov.com)	Three separate Yahoo-integrated state portals for citizens, business, and state government employees.
Virginia (www.state.va.us)	Allows users to create a customized "My Virginia" homepage linking to government services and features selected by the user.
New York State (www.state.ny.us)	Offers 1,108 permits online for 187 types of business.
Maryland State (www.state.md.us)	More than 40 types of professional licenses may be renewed online.
City of Indianapolis (www.Indygov.org)	Integration across agencies at the website level, use of geographical information systems, wealth of information, ease of use, range of interactive features.
Contra Costa County, California (www.co.contra-costa.ca.us)	Use of geographic information systems for customized mapping using assessor's office property parcels and values; school, police, and fire station locations; risk of natural disaster; environmental hazards; and political districts. Use of visual information for identification and adoption of stray animals.

Source: Compiled by authors.

Perhaps the most powerful aspect of IndyGov is its nearly seamless integration of agency and department functions into a citywide portal. Like Access Washington, the portal will become more powerful and useful as new services become available online and older proprietary systems are integrated and web enabled. These positive network externalities drive agency restructuring required for further integration at the portal level.

County government encompasses a range of activities that differ from those at state and municipal levels. Contra Costa County, located in the San Francisco/San Jose region of California, is currently developing innovative visual digital tools for citizen use. Contra Costa is not a representative county example because of the high rate of Internet penetration and literacy among its residents. Seventy percent of households in the county are estimated to be online. Use of Geographic Information Systems (GIS) data allows residents to custom design maps and suggests the potential of broadband visual information and geographic information systems for e-government. Such examples indicate next-generation services that advance beyond online administrative and clerical processing of transactions.

The Economic Impact of E-Government

In the current turbulent environment, it is difficult to predict developments in information and communication technologies during the next five years or their migration to government. The following section estimates the magnitude of the economic impact that the current state of information and communication technologies would have on the American economy if they were widely diffused in government.[28] Thus, the following estimates hold technology constant, although they estimate future values for other variables including penetration of Internet use and implementation of current Internet-related technologies in government. Given the heterogeneity of state, county, municipal, and town governments, adoption of e-government is likely to remain highly varied during the next decade.

Diffusion of e-government will occur unit by unit. Yet no consensus exists regarding the precise number of government units in the country. The count varies based on definitions and measurement. Figures presented

28. For a detailed description of the assumptions and methodology used in the following section of the report, please contact the lead author.

here are based on U.S. Census Bureau data. According to the 1999 *U.S. Statistical Abstract*, there were 87,568 governmental units in 1997, including executive and independent federal agencies, state and local governments, and special and school districts. Disregarding special and school districts, the number of public units at the federal, state, and local levels is 39,159.[29]

A likely scenario of e-government adoption follows. The adoption rate of e-government features will differ among government units for the reasons described earlier. Services for individual citizens and businesses are expected to be implemented first as public organizations begin to experiment with e-government. We base this claim not only on existing evidence from all levels of government, but also on the lower unitary costs of coordination for G2C versus G2B or G2G operations. After gaining experience with G2C operations, government actors may use their knowledge to develop G2B web-based procurement.

In the scenario drawn here, which is by no means the only reasonable one, it is expected that G2B operations will begin in the largest individual government organizations—for example, the Defense Department and other large purchasing agencies—and then diffuse to smaller units. Alternatively, the adoption of web-based procurement could begin with moderate-value operations that involve highly sophisticated actors in markets where high savings are anticipated, followed by adoption in the highest-value operations and then wider diffusion across the public sector.[30] The potential efficiency gains from the first scenario lend it greater credibility than the more risk-averse second example.

Over a longer period of time, on the order of decades, efficiencies will accrue from the adoption—or, more properly, the implementation—of internally integrated G2G operations. Linkages and coordination will increase as new norms, processes, and structural arrangements are negotiated. External pressure from executives and legislatures will be necessary to drive bureaucratic transformation at this level. Currently, a small number of innovators, described elsewhere in detail by Fountain, have built portals that provide virtual, or web-based, integration across agencies.[31] However,

29. The breakdown is 65 federal units, 50 state units, and 39,044 local units. Of the local units, 3,043 are classified as county; 19,372, as municipal; and 16,629, as town. U.S. Census Bureau (1999, table 500, p. 309).

30. It is assumed that 20 percent of procurement operations represent 80 percent of the public sector's expenditures in government procurement.

31. Fountain (2001c).

the back-end integration vital to capturing the efficiencies of G2G operations has barely begun.

This type of integration faces formidable bureaucratic and political obstacles, but represents the next major wave of government reform as redundancies and overlap among programs and agencies become more transparent and less easily justified in an Internet-based environment. To grasp the slow adoption of e-government relative to some other sectors of the economy, it is important to understand that a presence on the web is only a first step in a long series of deep modifications in the structure of the state.[32] Thus, adoption curves for e-government are likely to show the steepest rise in adoption, or the most rapid implementation, for G2C activities during the next half decade or so, followed by a more moderate adoption function for G2B in procurement and then by the relatively slow adoption of G2G over at least two decades as institutional changes are negotiated. Estimated differences in adoption functions for G2C, G2B, and G2G activities are given in figure 8-2.[33]

G2C: Estimated Cost Savings of E-Government

Efficiency gains of G2C e-government are currently the result of reductions in the operational, administrative, and compliance costs of processing the payments and documents required of citizens and business to transact with governments. These transactions include tax and nontax payments as well as new orders for and renewal of permits, registrations, and licenses, and hundreds of other types of transactions ranging across policy domains and government levels.[34] According to the Bureau of Economic Analysis, the sum of federal, state, and local government receipts, excluding contributions for social insurance and—for state and local governments—federal grants-in-aid, was $2.138 trillion dollars in 1999 (table 8-3).[35] U.S. Census Bureau data indicate that property, individual, and corporate income taxes

32. These types of technology-based institutional changes are analyzed in detail in Fountain (2001c).

33. Adoption patterns and functions summarized in this chapter are presented and motivated in detail in Osorio-Urzua (2000).

34. The analysis does not include taxation of Internet operations. For an excellent first approach to this topic, see Hal R. Varian, "Taxation of Electronic Commerce," Internet Policy Institute, Washington (www.Internetpolicy.org/briefing/4_00_story.html. [April 2000]).

35. Bureau of Economic Analysis (2000b, tables B-82, B-83). The BEA data used in this report estimate 1999 corporate profit tax accruals based on historical values.

at the state and local level represent, on average, 56.5 percent of the tax revenue of those governments.

The number of transactions between government and constituents that are amenable to web-based processing is enormous. In order to indicate the scale of transactions in the government sector given lack of information regarding the total number and cost of transactions between government units and citizens or businesses, one might consider a selected subset of transactions. Nearly 443 million transactions to register or monitor births, elementary and secondary school enrollment, college enrollment, motor vehicle registration and inspection, voter registration, construction permits for new housing, and patent and trademark initial applications take place annually. (The annual volume by type of transaction is presented in table 8-4.) All of these transactions require clerical handling, and, in many cases, administrative processing as well, making them more complex in nature, and therefore more expensive, than online bill payment. With few data available that measure cost reduction per type of transaction, our estimates are necessarily broad and provisional. The estimates given below suggest the scale of e-government G2C activities in terms of potential savings as well as complexities of institutional change.

Cost savings to government fail to capture the efficiencies of web-based transactions for citizens and business. For instance, the cost of compliance with current tax law given present administrative processing represents a drag on the economy. The *Tax Complexity Fact Book*, published by the Joint Economic Committee states that the IRS and the Office of Management and Budget (OMB) "estimate that Americans will spend 6.1 billion hours (over 3 million person-years) filling out tax forms, keeping records, learning tax rules, making calculations, and other tax-related work in fiscal 2000. . . . A measure of the 'opportunity cost' of compliance time has been roughly estimated by the OMB at $26.50 per hour in 1996, or about $30 today. . . . Thus, federal tax compliance costs based on 6.1 billion hours of compliance time are about $183 billion per year."[36] In addition, the *Fact Book* cited a report by Joel Slemrod, which estimated that "tax compliance costs represent about 10 percent of income tax collected." According to the *Fact Book*, this figure is more conservative than those generated by the Tax Foundation and the U.S. General Accounting Office, which estimate compliance costs of 15 percent and 19 percent, respectively.

36. Joint Economic Committee (2000).

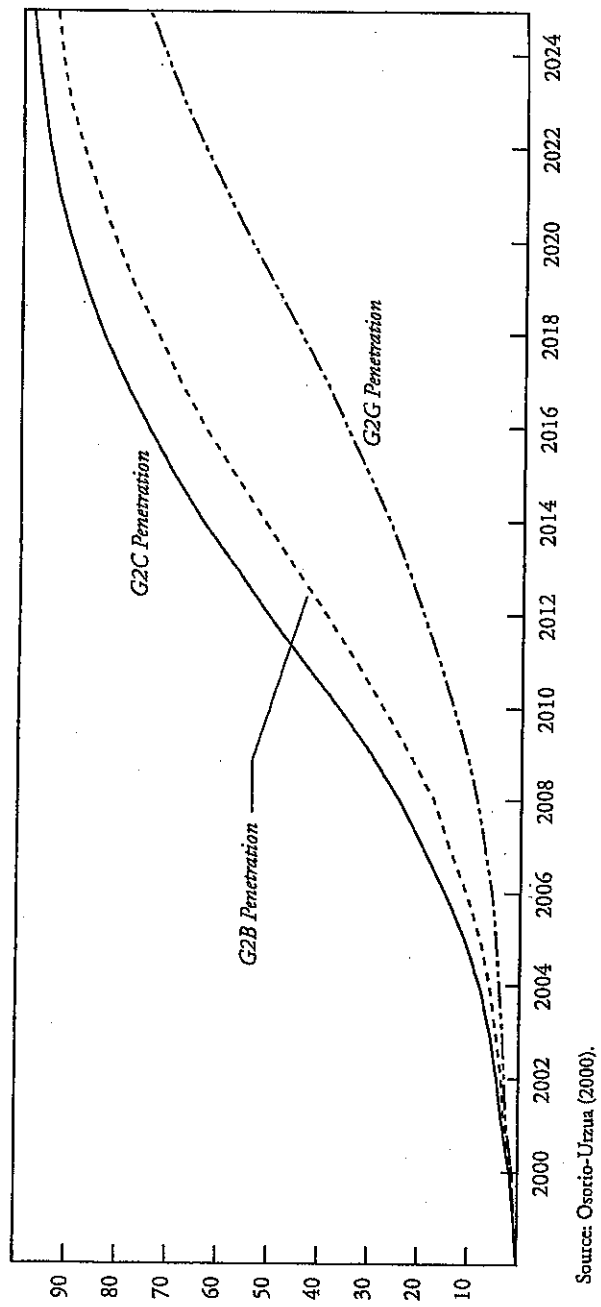


Figure 8-2. Differences between G2C, G2B, and G2G Adoption of E-Government Activities

Source: Osorio-Urzua (2000).

Table 8-3. *Federal, State, and Local Government Receipts, 1999*
Billions of dollars

Government level	*Personal tax and nontax*	*Corporate profits tax*	*Indirect business tax*	*Total*
Federal	908.0	222.4	101.5	1,231.9
State and local	252.4	37.0	616.8	906.2
Total	1,160.4	259.4	718.3	2,138.1

Source: Bureau of Economic Analysis (2000b, Tables B-82, B-83).

With respect to tax processing costs for local governments, according to estimates produced by GovWorks, cited in *Business 2.0*, "local governments collect more than $200 billion in property taxes each year, with manual, paper-based processing costs of more than $1 billion," or 0.5 percent of those revenues.[37] The processing costs for income taxes are likely to be much higher given their greater complexity. Tax processing costs to government are likely to be highest for federal taxes, followed by processing of state taxes, which are relatively lower in complexity and cost, and then local property taxes.

Few estimates have been developed to suggest the aggregate potential cost savings in the G2C category. An analysis in the *Forrester Report* projects that the number of online submissions to government will reach almost 320 million by 2006. Moreover, the analysis predicts that revenue collected online by governments will increase from $5.1 billion a year in 2000 to $602.4 billion in 2006.[38] These figures indicate the potential size of e-government but fail to provide estimates of cost savings. Moreover, the analysis in the *Forrester Report* is based on a small, unrepresentative sample of fifteen governments. Thus, the numbers reported may be much higher or, if implementation were slowed, much lower. The increase in the size of e-government during the time period considered seems ambitious given our findings on the implementation, adoption, and institutional issues still to be resolved and and the pace that innovation is adopted.

Using the *Forrester* projections for adoption, a discount rate of 7 percent, and a highly conservative estimate of savings at 7 percent of revenues

37. Sean Donohue, "And Now, Ladies and Gentlemen, the Internet Will Streamline Government Bureaucracy," *Business 2.0*, EBusiness Section, June 27, 2000.

38. Sharrard and others (2000).

Table 8-4. *Volume of Selected Government Transactions by Type*
Thousands

Year	*Births of registry*	*Motor vehicle registration and inspection*	*Patent application*	*Trademark application*	*Voter registration*	*School enrollment, entry operation*	*College enrollment, entry operation*	*Number of new housing units, construction permits*
1998	3,803	210,881	239	230	2,137	...	...	1,441
1999 (estimated)	3,900	213,992	247	245	2,157	222	209	1,612
2000 (estimated)	3,914	217,103	255	260	2,176	224	210	1,652

Source: All data are from U.S. Census Bureau. Births (www.census.gov/population/projections/nation/detail/componen.a). Motor vehicle registration: U.S. Statistical Abstract, 1999 (table 1439); registration is counted twice to account for registration and inspection. Patent and trademark applications: U.S. Statistical Abstract, 1999 (table 893). Voter registration (www.census.gov/population/socdemo/voting/history/htab01.txt); 71.9 percent of the population was registered to vote. School and college enrollment (www.census.gov/population/socdemo/school/taba-1.txt). Construction permits (www.census.gov/const/C40/table1/table1a.txt).

(meant to offset partially the more ambitious adoption rate), the estimated annualized savings of G2C adoption of web-based tax processing alone would be $20.22 billion, or $2.83 billion a year for the period 2000–2006. These savings equal 0.031 percent of gross domestic product (GDP). (All numbers are in 1999 dollars.) They do not include hundreds of millions of other transactions moving to web-based processing. Working with the subset of 443 million transactions, described earlier, if each transaction costs, on average, $10 for government to process using paper-based methods and if on-line processing costs led to a 30 percent reduction in those costs, then moving this subset of government transactions to the web would save very roughly an additional $1.34 billion a year (443 million × $10 × 0.3).

G2B: Estimated Effects of E-Procurement in the Government Sector

On average the American government spends approximately $524 billion a year on procurement operations, or about 6.04 percent of GDP (in 1999 dollars).[39] Between 1995 and 1999, procurement expenditures totaled $2.621 trillion (table 8-5). Attention to the potential of G2B for cost savings in government is beginning to affect the way public organizations manage procurement operations. Electronic procurement yields three types of efficiency benefits: operational savings from using digital instead of traditional manual operations; higher efficiency of the procurement process itself; and improvements in the transparency of government procurement markets and their processes.

Although there are overlaps among these three categories of savings, each category offers distinct benefits. In some bidding processes, for example, full transparency before or during the process might endanger competition if signaling and reputation among incumbents in a process affects the influence of new entrants. Transparency usually increases efficiency but does not always do so. Operational, or transaction costs, savings are different from efficiencies in the procurement process itself that might allow enhanced competition over a broader market. Some, but not all, enhancements to competition are attributable to transparency. The benefits of e-procurement depend upon variables such as type of operation; the goods or services involved; the sophistication of the counterparts (suppliers and public agencies); and time (due to network externalities). Private firms such

39. Bureau of Economic Analysis (2000a, tables 307, 308). Numbers adjusted by the Consumer Price Index.

Table 8-5. *Government Procurement Expenditures*
Billions of 1999 dollars

Expenditure	*1995*	*1996*	*1997*	*1998*	*1999*
GDP	8,114	8,291	8,679	9,026	9,299
Government consumption expenditure and investment	1,492	1,509	1,543	1,569	1,628
Government procurement	482	498	518	539	584
Federal defense	172	174	169	166	177
Federal nondefense	39	42	45	48	56
State and local	271	283	304	324	351

Source: Bureau of Economic Analysis (2000a, tables 307, 308). Numbers adjusted by CPI.

as FreeMarkets.com and SupplierMarket.com report overall average savings of approximately 20 percent for web-based procurement activities. Goldman Sachs estimates product cost savings from electronic markets of 2 to 39 percent, depending upon the industry segment involved.[40] As of February 12, 2001, FreeMarkets.com claims to have generated $2.7 billion in savings to its customers from a total market volume of $14.0 billion.[41]

One scenario of the adoption of online procurement in government follows. The early adopters, attracted by potential cost savings, are likely to be bigger buyers, not only in number of operations but also in value. In a second stage of development, joint operations might be developed between state and local governments, obtaining higher efficiency rates. For example, Washington State focuses in its strategic e-government plan on interaction and integration between the state and local governments. Similarly, Massachusetts is actively pursuing a regional procurement consortium, called EMall. The state estimated unitary operational savings for one procurement operation as follows: the paper-based operation took 265 minutes at a cost of $110.37; processing using electronic data interchange (EDI) required 120 minutes and cost $49.98; web-based procurement using EMall required only 25 minutes and cost $10.25.[42] Low-cost operations are likely to continue being performed as usual. Thus, given gains in efficiency and purchasing power, high-value operations are estimated in

40. Goldman Sachs, "B2B: 2B or Not 2B?" Version 1.2: the Tech Conference Edition, Feb. 24, 2000, p. 4. New York.

41. www.freemarkets.com/enter_marketplace.asp (February 12, 2001).

42. Commonwealth of Massachusetts (1999, table 6, p. I-42).

this scenario to be adopted more rapidly. If such adoption is not the case, efficiency gains would be smaller.

Figures produced by Goldman Sachs analysts estimate "government spending to businesses," a category somewhat different from procurement operations given above, at $1.65 trillion in 1998, with only 0.3 percent of these transaction on the Internet in that year. They project that government spending to businesses will grow to $2.09 trillion, of which 4.5 percent will be online by 2004.[43] Using the Goldman Sachs growth projection, a 7 percent discount rate, and a 20 percent savings rate, a rough estimate of cost savings from G2B activities from 2000 to 2004 is $13.44 billion, or $2.69 billion annualized, which represents 0.03 percent of GDP. (All figures are in 1999 dollars.)

Adding these cost savings for G2B to those for G2C tax processing online yields estimated cost savings with a net present value of $59.78 billion from 2000 to 2004, or $11.96 billion annualized. These highly conservative estimated cost savings represent 0.13 percent of GDP. They do not include savings from G2C nontax transactions or several efficiencies gained from, for example, the use of geographic information systems. If those are added and if G2C savings are higher, the cost savings estimate could easily double or triple in size.

Government to Government: Convergence in the Public Sector

In addition to the savings reported for G2C and G2B channels, major efficiencies are anticipated from the development of G2G relationships. In fact, some of the more substantial savings are likely to fall into this category. These institutional developments, as noted previously, will take longer to negotiate, and the resultant savings are more difficult to measure because they derive from organizational and structural changes, the counterpart of structural changes in an industry sector, rather than from relatively simpler business process redesign along a short segment of the value chain. The adoption of e-government in its G2G dimension will be pulled forward by the success of G2C and G2B, but G2G integration implies institutional complexities and political challenges that are more difficult than those at the other two levels.

43. Goldman Sachs, "B2B: 2B or Not 2B?" Version 1.2: the Tech Conference Edition, Feb. 24, 2000, table 6, p. 10. New York.

The natural next step of G2C applications—and an innovation already taking place—is to graduate from websites oriented to type of service to portals oriented to "type of customer." Well-functioning portals, as discussed earlier, require back-end integration and significant cooperation, or social capital, within networks of agencies and programs.[44] Development of G2G capacity will require greater technological, managerial, and political readiness than is currently found in many agencies and governments. Current constraints on G2G development include the following: institutional stovepipes, or silos, reflected in oversight and budget processes that maintain incentives for autonomous operations; administrative independence of federal, state, and local governments, which implies that executives face contradictory political interests in their environments; and legal restrictions regarding information sharing for some key organizations (such as the Internal Revenue Service). Moreover, public concern remains high regarding privacy and security of citizen and firm data in forms that are integrated and manipulated across agencies and on the web.

Few data are available to estimate the economic impact of G2G, which is an additional obstacle to its development. Reliable information and accurate data are needed for both policy and decisionmaking processes. Major cost savings with respect to G2G initiatives will lie in avoiding duplication of information gathering, updating, and storage within networks of programs and agencies; reducing mailing and paper storage of information sent and received; and saving time and resources by more efficient service. It is highly likely that G2G integration and consolidation would lead to downsizing. Despite serious obstacles—and a truism in policy studies that interagency coordination is inordinately difficult—a surprising number of partnerships across agency boundaries indicates a growing readiness and ability to engage the benefits of G2G arrangements. In fact, cross-agency systems offer one of the most exciting and promising developments in government with the promise not only of cost savings, but also of the ability to solve otherwise intractable policy problems that fall inherently between the boundaries of agencies.

A recent federal experiment, the International Trade Data System, demonstrated the dramatic efficiency gains possible to government and business from greater integration of the sixty-three federal agencies with jurisdiction over some aspect of the trade administration process. A more integrated, streamlined trade system has become a necessary adjunct to

44. Fountain (1998).

just-in-time, global business processes. But this experiment, currently stalled, also demonstrates the vast political and bureaucratic struggles that lie on the horizon as governments attempt to restructure at deeper levels to gain efficiencies of e-government.[45]

Other economic effects of e-government have not yet been considered. As government actors begin to exploit G2G integration, the efficiencies that result are likely to produce reductions in assets owned and rented by public agencies. It may not be necessary for governments to maintain as many separate local offices of various agencies. The types of co-location and service integration projects that have been continuing in government for more than a decade, before the use of the Internet, will be catalyzed by the potential of the Internet for consolidation, rationalization, and integration.

Regardless of the extent to which e-government is developed and managed by public units or outsourced to third parties, labor force reductions are likely in the public sector given the current political and cultural antipathy toward government. Productivity estimates are difficult to calculate, in part, because deep downsizing in government during the past decade has put many units below adequate staffing levels. Thus, some of the productivity gains from e-government will be used to restore capacity in services and activities that require people rather than automation. For example, many regulatory agencies currently lack enough qualified employees to carry out inspection and enforcement functions. In other cases, programs have been understaffed in anticipation of expected productivity gains from information technologies. Thus, some productivity gains have already been anticipated and employee cuts made.

Finally, in a networked environment, policymakers must consider the significant political and financial risks associated with failures in some of the network's major nodes. Recent alarming events in financial networks readily convey the types of risks inherent in networked government.[46]

Measuring Readiness for E-Government

To analyze the economic impact of information and communications technologies in government, it is necessary to discuss, at least briefly, the

45. See Fountain (2001c) for a detailed case analysis of the International Trade Data System and its development.

46. For an analysis of networked computing and its risks, see Rochlin (1997).

elements of readiness for e-government development. Three different levels of readiness may be considered in the strategy of development for any e-government project. These dimensions are expressed in terms of the levels of technological, managerial, and political readiness of any public sector's subsystem target for an e-government project. These levels of readiness will influence the time and shape of efforts to introduce web-based services and transactions. Technological readiness is a necessary but not a sufficient precursor to e-government development. Management and political readiness influence whether a project will be undertaken at all and, if so, how it will be developed and managed. Here "readiness" represents a number of institutional variables.

Technological readiness should be understood as both internal and external. External readiness is defined as access to and quality of Internet use for constituencies. Internal readiness refers to the agency's technological infrastructure and the technical skills of its work force.[47] Government salary structures make it hard to compete for technically qualified workers, especially at the local level of government. Constituencies with different levels of expectations, sophistication, education, or income, among other variables, present different interests and drive different priorities for e-government projects. In addition, the quality of an agency's information and communication technology infrastructure and overall skill level are critical inputs to make-or-buy decisions.

Managerial readiness encompasses an agency's internal capacity, including the quality and sophistication of internal operations. This area of readiness may be understood broadly to include the efficiency and effectiveness of the supply chain, the characteristics of the agency's culture, its capacity to adapt to and manage change, and other features. Independent of technical readiness, an agency that is well managed is likely to have a higher probability of success implementing either internal or outsourced e-government solutions.

Political readiness points to the political feasibility of e-government projects. Political variables that affect readiness include perceptions and interests of public servants, potential labor cuts generated by e-government development, administrative turnover or changes in executive direction, the desire of political actors to be associated with e-government, budgetary resources and directions, orientation to long- versus short-term results, and public perception about an initiative. In this context, the effect of programs like the National Performance Review has been critical for generation of managerial and political readiness for e-government. Large-scale reform efforts at all levels of government during the past fifteen years have generated conceptual, managerial, and technological arrangements in which e-government has become feasible. These reform movements have contributed to a political and managerial environment focused on public sector effectiveness, responsiveness to constituents, modernization and greater rationalization of government operations, and the use of information technology to modernize and enhance government.

47. This model for e-government has been adapted from frameworks in the field of strategic analysis and, in the public sector, from Sebenius and Lax (1986) and Moore (1995). For a detailed description, see Osorio-Urzua (1999) and Information Technologies Group, Center for International Development at Harvard University, "Readiness for the Networked World: A Guide for Developing Countries" (www.readinessguide.org).

The failure rate of government information technology projects has been estimated by Todd Ramsey, IBM's worldwide head of government services, at approximately 85 percent in the sense that the projects take longer to implement, have higher costs, and deliver less than expected.[48] The major reason for this failure rate derives, in part, from lack of alignment among technological, managerial, and political variables in the government sector. It also derives from the need to produce and deliver services, in the absence of a pricing structure, to the entire population rather than to a carefully selected and "educated" market segment.[49] What is less widely reported, however, is that major information technology projects in the private sector typically run over budget and schedule as well, in large part because of the complexities involved in integrating new technologies with existing organizational systems and processes.

Thus, the efficiency criterion provides only a minimal basis for evaluation of the desirability and feasibility of electronic government. Serious, unresolved, barely analyzed issues regarding the ownership, security, and privacy of citizen and business data; Internet penetration in the population; interest groups; differing capacities among public agencies; and private support for government versus downsizing of the public sector, among others, will continue to affect the development and shape—and, hence, the efficiency gains—of e-government.

48. "Government and the Internet," *The Economist*, June 24, 2000.
49. Fountain (2001b).

Conclusions

To reiterate the opening of this chapter, American government is in the early stages of deep transformation as a result of the Internet and a host of related developments in information and communication technologies. Examples of significant cost savings are growing in number as institutional changes continue in the production and delivery of government information and services. Deeper organizational and institutional restructuring of government is likely to be negotiated more slowly than the adoption of web-based applications that function largely at the boundary of agencies. But this restructuring has the potential to generate further cost savings to government.

In this chapter we distinguished between early-stage innovations in boundary-spanning functions producing efficiency gains in information provision and service delivery and later-stage, deeper transformation of internal government agency and cross-agency structures and processes, predicting that the latter are likely to play out over the next twenty years rather than at Internet speed. We also focused on the quantifiable cost savings to government of web-based service delivery systems rather than on the more difficult-to-quantify benefits to corporate and private citizens from interacting with government over the net. Annualized cost savings to the government sector of as much as $12 billion are not unreasonable to expect. It would not be surprising if the savings were significantly higher given the volume of transactions and the administrative and information-processing intensity of government. Yet several obstacles, noted in this chapter, are likely to affect efficiency gains and unproblematic development of digital government. Under the general term, "readiness," we included lack of funding for information infrastructure development, privacy and security challenges, bureaucratic politics, insufficient technical expertise in government, and unresolved normative challenges regarding the appropriate role of the private sector in the development and management of digital government. With respect to the final challenge, the current pricing structures for private development of e-government provide substantial profits to the private sector and have been insufficiently analyzed and scrutinized by governments.

Fundamental, normative questions of governance and state structure are raised by e-government. Will e-government empower democratization and decentralization? If it does, what then are the effects on demand for infrastructure, information, services, and interactivity? These types of questions, at the boundary between abstract theory and concrete institutional structure and process, have been virtually ignored in treatments of electronic government. Yet they are vitally important.

A critical set of policy questions bears on the nature of public-private partnerships and their appropriate role in the design, development, management, control, and, in some respects, the ownership of e-government. Related to concerns regarding privacy and security are a new set of questions regarding the ownership, control, use, and manipulation of what has traditionally been government data. A recent Supreme Court case enjoined government from selling some types of government data to private firms. The current legal structure is inadequate as a framework for e-government. Studies of privatization do not take into account the environment and risks posed by the Internet. Governments must be careful, in their zeal to modernize, not to unwittingly betray the public interest. It will remain the province of public servants and elected officials to forge long-term policies that guard the interests of citizens, even when those policies seem inefficient or lacking in strategic power.

Private sector firms have aggressively targeted government as a lucrative, enormous market to be tapped for the sale of e-solutions. Economic incentives in the private sector lead rapidly to the generation of quick, often useful solutions and applications that should not be ignored by governments. But information architecture, both hardware and software, is more than a technical tool; it is a form of governance. The outsourcing of architecture is, in effect, the outsourcing of policy decisions. Economic and competitive processes that drive product development and marketing in the information technology industry must not substitute for—or be confused with—the far-reaching obligations of policymaking.

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