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Advancing E-Government at the Grassroots: Tortoise or Hare?

American grassroots governments have rushed to join the e-government revolution. Although there is a growing body of e-government literature, little of it is empirical. Using data from two nationwide surveys, we conduct a longitudinal examination of local government adoption of e-government, Web site sophistication, the perceived impacts of e-government, and barriers to the adoption and sophistication of e-government. We also discuss correlates of e-government adoption and sophistication with selected institutional factors. We find that e-government adoption at the grassroots is progressing rapidly (if measured solely by deployment of Web sites). However, the movement toward integrated and transactional e-government is progressing much more slowly. Continuing research, particularly longitudinal study, is needed to monitor the evolution of e-government among U.S. local governments, especially to keep pace with the practice and to ascertain the actual impacts of e-government.

Over the past few years, an increasing amount of both popular and scholarly attention has been focused on electronic government, or e-government. Defined as the electronic provision of information and services by governments 24 hours per day, seven days per week (Norris, Fletcher, and Holden 2001), e-government is said, at the minimum, to expand and extend the ability of government organizations to serve their constituencies and to promote a host of other, mainly positive, benefits to both government and its citizens.

Surveys conducted within the past five years (ICMA/PTI 2000, 2002) and a variety of other studies[1] show that in the United States, all federal agencies, all state governments (including most, if not all, departments within the states), and over 80 percent of all general-purpose local governments have Web sites. Through these sites, they offer information and provide services 24/7 to citizens, other governments, businesses, and nonprofit organizations.

Evidence from these studies, however, also shows that relatively few governments in the United States at any level and of any size have developed truly sophisticated e-government offerings. Most e-government in the United States today is principally informational—that is, it involves the one-way transmission of information from government to citizens, usually by way of static information pages ("brochureware"), downloadable forms, and e-mail. Few governments offer much in the way of two-way transactional e-government (making purchases, payments, and reservations, or recording complaints) or provide either horizontal (within a governmental unit) or vertical (among levels and layers of government) e-government integration. Fewer still have established true portals through which visitors can navigate to needed services and information transparently regardless of source or location.

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The extent and quality of e-government at different levels of U.S. government continues to evolve. In fact, the evolution appears to be rapid and diffuse, truly a moving target. In such an environment, practitioners face considerable challenges just to stay current with the ever-changing technological applications, and scholars face equivalent challenges in keeping track of the deployment and actual impacts of e-government. Although a growing number of e-government studies are emerging in the public administration literature, few, if any, have examined the continuing evolution of e-government from a longitudinal perspective. While these studies certainly advance our knowledge of e-government, they are limited to studying the nature and scope of e-government at a particular time.

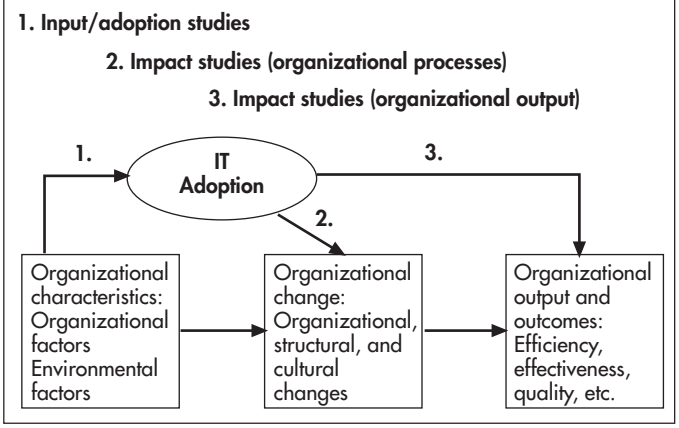
To fill this research gap, we evaluate the evolutionary process of e-government using two data points. Periodic examination of e-government at the local level is important because the grassroots governments are closest to citizens and deliver the greatest number of services directly to the people. Using data collected from two similar surveys conducted during two different periods (2000 and 2002), this study examines the adoption, development, and impacts of e-government at the grassroots level, as well as the barriers that city and county governments face. We expect to find more changes in the *adoption* of e-government than in its actual impacts because we only examine data from a two-year period.[2]

American city and county governments are America's grassroots governments. They are the general-purpose governments that are closest to and deliver the greatest number of services directly to the people. Therefore, periodic examination of e-government at the grassroots level is important because of its potential reach, cost, and impacts.

Guiding Framework

In this section, we present an exploratory framework that is drawn from the literature of information technology (IT) applications in public administration (Kraemer, Dutton, and Northrop 1981; Danziger and Kraemer 1986; Norris and Thompson 1991). Figure 1 depicts the major dimensions that characterize the adoption of IT in public organizations and the study of this phenomenon in public administration: (1) the input dimension, including both internal organizational and external environmental factors associated with adoption; (2) adoption itself; and (3) the impacts of adoption, including the impacts on internal organizational processes and organizational outputs. Here we focus on the input/adoption and impact dimensions. Table 1 presents a representative, although certainly not exhaustive, list of works in the field that address these dimensions of IT adoption and impacts.

Figure 1 Guiding Framework



The first dimension we examine is the input dimension, where scholars attempt to understand how independent variables within and external to government organizations affect governmental adoption of IT. These studies are influenced by the long-standing innovation and diffusion literature (Rogers 1985). Many studies have found that organization size is one of the primary predictors of the IT adoption (Brudney and Selden 1995; Norris and Demeter 1999; Holden, Norris, and Fletcher 2003; Norris and Kraemer 1996; Moon 2002). Other governmental demographic variables often found to be associated with local government adoption of IT include the form and type of government, region of the country, and metropolitan status.

Other scholars have examined how organizational environment (government size and public-service demand) and organizational factors (professionalism, slack resource, and administrative performance) affect the adoption of computer technologies (Brudney and Selden 1995). For example, Norris and Kraemer (1996) found the existence of a central IT department was associated with the adoption of leading-edge information technologies by local governments. In their study of IT diffusion, Bugler and Bretschneider (1994) found that organizations' perceptions of particular needs (that is, information-sharing barriers) facilitated new IT adoption in public organizations. Drawing on the technological acceptance model,[3] Northrop et al. (1994) identify three individual factors (training, friendliness of software, and users' computer background) that affect the use of computers. Likewise, Nedović-Budić and Godschalk (1996) identify eight human factors that affect the adoption of geographic information systems in local governments. Overall, the primary research questions in this dimension center on organizational and individual determinants of organizational (governmental) adoption and use, or individual use, of IT.

Our second dimension is the impact of IT adoption on internal organizational structures and processes and on organizational outputs and outcomes. Here, scholars ex-

Table 1 Information Technology Dimensions, Theories, and Research

Dimensions	Theories	Research
Input dimension: Organizational and environmental factors affecting the adoption of information technology	Adoption/diffusion model; technological acceptance model	Adoption and diffusion of IT: • Brudney and Selden (1995) • Venkatesh and Davis (2000) • Moon and Bretschneider (2002) • Moon (2002) • Norris and Demeter (1999) • Norris and Kraemer (1996) • Holden, Norris, and Fletcher (2003) • Northrop et al. (1990) • Nedović, Budić, and Godschalk (1996)
Impacts: Internal organizational processes*	• Economic theories • Microeconomic theories • Transaction-cost theory • Agency theory • Behavioral theories • Decision/control theories • Sociological theories • Postindustrial theories	Effects of IT on organizational changes: • Moon and Bretschneider (2002) • Laudon and Laudon (1996) • Kraemer and Dedrick (1997) • King and George (1991) • Kraemer, Dutton, and Northrop (1981) • Peled (2001) • Holden, Norris, and Fletcher (2003) • Kraemer (1991)
Impacts: Organizational outputs and outcomes	• Effectiveness model • Productivity model	IT Impacts of IT: • Kraemer and Dedrick (1994, 1997) • Hendrick (1994) • Specht (2000) • Heintze and Bretschneider (2000) • Danziger (1979) • Northrop (1990) • Norris (2003b) • Norris and Kraemer (1996) • Bailey (1991) • Kraemer, Gurbaxani, and King (1992) • Kraemer and Pinsonneault (1993)

*The impact of information technology on organizations is adapted from Laudon and Laudon (1996); see especially 107.

amine how the adoption and use of IT affects organizational behavior and change. Some of the common research issues include IT and organizational centralization or decentralization; IT and support for new or existing structural alignments (King and George 1991; Kraemer, Dutton, and Northrop 1981; Kraemer and Dedrick 1997; Norris 2003b); the effect of IT on organization size (Thorp 1998); IT and red tape (Moon and Bretschneider 2002; Peled 2001); IT and organizational culture (Garson 2003; Vallas 2000); IT and organizational decision-making and business processes (Norris 2003b; Senevirate 1999); and the effects of IT on staff roles at various levels (Holden, Norris, and Fletcher 2003; Kraemer and Pinsonneault 1993).

In focusing on managerial and organizational changes, Laudon and Laudon (1996) summarize the contribution of economic and behavioral theories to the understanding of the effects of IT on organizational changes. Microeconomic theories are often applied to demonstrate the substitution effect of IT for labor and capital, which leads to the reduction of organization size. Arguing that IT decreases transaction costs in organizations, transaction theorists are often employed to support the positive effect of IT on organizational reduction. Similarly, agency theory also explores how IT can change the principal–agent relationship and improve the quality of management and control. Decision and control theories are often used to examine how IT affects organizational and decision structures (centralization versus decentralization), while macro futuristic arguments are often discussed in the postindustrial literature. While some studies in this literature show that under some circumstances IT can lead to structural, cultural, and procedural changes in organizations, others conclude that IT contributes very little to organizational change and instead supports the status quo (Kraemer 1991).

This dimension also focuses on how IT affects organizational outputs and outcomes such as productivity, efficiency, and effectiveness. As Kraemer and Dedrick (1997) summarize, there has been a long discussion about whether IT increases the level of productivity in organizations. Northrop et al. (1990) found that payoffs from computing were more likely with the automation of routine applications. However, Norris (2003b) has shown that greater sophistication of use (for instance, through the use of leading-edge applications, especially when institutionalized) may also produce payoffs. Norris and Kraemer (1996) also found that IT was more widely used and produced greater benefits in cities where the IT was more sophisticated.

Although it is difficult to measure the economic return of IT, and the productivity impact of IT has been subject to question (Bailey 1991), more recent studies suggest there

is a positive correlation between IT use and productivity. For example, some studies on the payoffs of IT investment, based on data from Asian and Pacific countries, found a positive correlation between IT investment and productivity (Kraemer and Dedrick 1994; Kraemer, Gurbaxani, and King 1992). Studying the role of computer technology in local governments, Danziger (1979) learned there is a strong correlation between computer technology and productivity in local governments. At the organizational level, Hendrick (1994) also suggests that effective management requires high-quality management information systems, in addition to transaction-processing systems and decision-support systems. Specht (2000) also asserts that IT investment affects IT performance and organizational performance. Some empirical work has also found that IT innovation affects organizational performance and e-government effectiveness (Heintze and Bretschneider 2000).

Although mixed research findings are often presented, the literature largely supports the positive impacts of IT on organizational outcomes. Norris, for instance, reports that "The evidence from a variety of studies over the past two decades of research on IT in local government points unambiguously to the following conclusion: the impacts of IT in local governments are mostly positive, although the technologies are not without problems. Moreover local government officials and end users are quite satisfied with these technologies and believe that they have produced mainly positive results" (2003b, 162).

To investigate the continuing evolution of e-government at the local level, we take advantage of the unique longitudinal surveys conducted by the International City/County Management Association and Public Technology, Inc., in 2000 and 2002. Based on our analysis of the two data sets, we examine the adoption of e-government by U.S. local governments, the age of local government Web sites, and the evolution of local e-government as the *input dimension*. We also review organizational changes produced by e-government as the *impact dimension* and then discuss changes in the perceived barriers to the development of local e-government between the two periods.

Data and Methods

The data for this article come from surveys conducted in 2000 and 2002 about local government adoption of e-government in the United States (ICMA/PTI 2000, 2002). The 2000 survey was mailed to 3,749 local governments, including 2,899 municipalities with populations greater than 10,000 and 850 counties with either council-administrator (manager) or council-elected executive governments. Over half the local governments surveyed (50.2 percent) responded, including 50.7 percent of municipalities and 48.2 percent of counties. There were somewhat differing response rates by jurisdiction type, and the following were somewhat overrepresented in this survey: small and medium-sized local governments, western local governments, central and suburban local governments, council-manager cities, and council-administrator counties. Otherwise, the respondents were reasonably representative of U.S. local governments.

The 2002 survey was mailed to 7,844 local governments, including 7,005 municipalities with populations greater than 2,500 and 839 counties with either council-administrator (manager) or council-elected executive governments. Over half the local governments surveyed (52.6 percent) responded to the 2002 survey, including 52.8 percent of municipalities and 50.4 percent of counties. There were somewhat differing response rates by jurisdiction type, and the following were somewhat overrepresented in this survey: medium-sized local governments, north-central and western local governments, central and suburban local governments, council-manager cities, and council-administrator counties. Again, however, the respondents were reasonably representative of U.S. local governments. To allow direct comparisons between the 2000 and 2002 surveys, we selected all responding counties from the 2002 survey, but only responding municipalities with populations greater than 10,000.

This analysis includes descriptive statistics, cross-tabulations, and basic tests of statistical significance (chi square) for associations between reported local government demographic characteristics (independent variables) and various attributes of e-government (dependent variables). The demographic characteristics included:

- Population: large (over 250,000), medium (25,000–249,000), or small (under 25,000)
- Type of government: city or county
- Form of government—mayor-council or council-manager (for cities) and council-administrator or council–elected executive (for counties)
- Region: West, South, North-Central, or Northeast
- Metropolitan status—central, suburban, or independent city.[4]

E-government attributes included Web site adoption, the age of the Web site, and Web site sophistication, indicated by whether governments offer online transactions. Based on previous research (Holden, Norris, and Fletcher 2003; Norris and Campillo 2003), we expect the typical pattern of statistically significant relationships between the independent and dependent variables to be in the directions indicated previously. That is, larger local governments, cities, those with professional managers, those located in the West and South, and central cities and suburbs are more likely, for example, to have adopted e-government, to be early adopters of e-government, and to offer transactions on their Web sites.

Input Dimension

The input dimension includes local government adoption of e-government, the age of local government Web sites, and the development or evolution of local e-government (measured by the transactional capabilities of local Web sites).

Adoption

Clearly (and not surprisingly, based on previous research), the vast majority of the American local governments have Web sites. In 2000, 83.6 percent had Web sites and in 2002, 87.7 percent had them, an increase of 4.1 percent in two years (table 2). Additionally, most of the local governments without Web sites in both years indicated they had plans to develop Web sites within the next year (69.9 percent in 2000 and 71.4 percent in 2002). We also found that adoption of a Web site was related, in the predicted directions, to population, type and form of government, and metropolitan status ($p = <.01$). That is, large local governments, cities, cities and counties that are professionally managed, and central cities and counties (followed by those that are suburban) were more likely than their counterparts to have adopted Web sites. There was a statistically significant relationship between region and adoption as well, but it was slightly different than expected. Here, the order of the relationship was West, North-Central, South, and Northeast ($p = <.001$). The predicted relationship was West, South, North-Central, and Northeast.[5]

Table 2 Web Site Adoption

		2000			2002	
		Number	Percent		Number	Percent
A. Does your government have a Web site?	Yes	1,573	83.6	Yes	1,866	87.7
	No	308	16.4	No	262	12.3
	Total	1,881	100.0	Total	2,128	100.0
		Number	Percent		Number	Percent
B. Does your local government plan to create a Web site in the next year?	Yes	207	69.9	Yes	187	71.4
	No	89	30.1	No	75	28.6
	Total	296	100.0	Total	262	100.0

Among those planning to adopt Web sites, there were no statistically significant relationships between size, form of government, and region and plans to adopt. A relationship was obtained between metropolitan status and plans to adopt ($p = <.01$), but in a different direction than expected. Here, suburban and independent governments were more likely to report plans to adopt than central governments. This makes sense because central governments were more likely to have already adopted e-government than suburban and independent governments. The type of government appears to matter here as well, with counties being more likely to report plans to adopt than cities. Again, this makes sense because cities were more likely than counties to have adopted Web sites.

Regardless of the reported data, readers should interpret local governments' answers to questions about their plans to adopt technology cautiously (Norris 2003b). If 69.9 percent of nonadopting local governments had, indeed, developed Web sites by 2001, as they said they would (0.699 x 14.4 percent nonadopters = 10.1 percent), this would have increased the total number of adopters to at least 93.7 percent by 2002 (83.6 percent adopters + 10.1 percent plan to adopt). As seen in table 2, however, the increase in the overall adoption of Web sites between the two surveys was only 4.1 percent.

Additionally, in 2002, 71.4 percent of nonadopters said they had plans to create a Web site within the next year. If this were the case, it would have produced an overall adoption rate of 96.5 percent, which is unlikely considering the apparent slowdown in the pace of adoption (12.3 percent nonadopters x 71.4 percent plan to adopt = 8.8 percent; 87.7 percent adopters + 8.8 percent plan to adopt within a year = 96.5 percent).

Age of Web Sites

The 2002 survey did not repeat the question asked in 2000 about the age of local government Web sites (table 3). In 2000, over two-thirds (68.5 percent) of local governments reported their sites were three years old or younger, over one-quarter (27.1 percent) reported their site was four to five years old, and only 4.4 percent said their site was more than five years old (table 3). Large, western, and central local governments were more likely to be early adopters ($p = <.001$) than their counterparts. No statistically significant relationships were obtained between form and type of government.

Even though the 2002 survey did not ask about the date of adoption, we can be reasonably sure that at this date (2005), two-thirds or so of sites would be six years old or less, about a quarter would be nine to ten years old, and a minority would be more than ten years old. This finding continues to tell us that e-government at the grassroots in the United States is a new phenomenon.

Table 3 Age of Web Site

	2000	
	Number	Percent
Three years or less	803	68.5
4–5 years	318	27.1
More than five years	52	4.4
Total	1173	100.0

Note: The question about age of Web site was not asked in the 2002 survey.

Early local government Web sites, that is, those established by early adopters (Rogers 1985), were mainly informational. They tended to contain what practitioners often call "brochureware" (Norris 2003a)—that is, static information that site visitors can read.[6] (This is also true of

some initial sites developed by later-adopting governments. However, many late adopters have learned from the experiences of early adopters and have started with sites that include more than just static information.)

Sites with the next greatest level of sophistication (that is, more than simply one-way information provision) provide users with the capability to download information. (Somewhere along the line, often in the first and second levels of sophistication, governments also enabled citizens to communicate, usually by e-mail.) Greater sophistication adds even more transactional capability to government Web sites. This provides citizens the ability to transact business with the government online. The next most sophisticated sites are informational, have transactional capability, and are integrated horizontally (within the government) and vertically (across governments). The most sophisticated sites build on the latter to provide full portal capability.[7]

How sophisticated are local government Web sites today? The data from the two surveys permit longitudinal examination of the extent to which local governments provide transactions on their sites. We use transactional capability as a proxy for site sophistication.[8] We divide transactions into financial and nonfinancial because it is technically (and in some cases legally) easier and involves fewer privacy and security concerns to automate nonfinancial than financial transactions. The data in table 4 show that, with only some exceptions, few local governments offered online transactions. Among nonfinancial transactions, only one—the ability to download forms for manual completion—was provided by a majority of local governments (65.8 percent).[9] Only two transactions (requests for service, 33.3 percent, and requests for records, 32.2 percent) had been adopted by as many as one-third of local governments. All other nonfinancial transactions had been adopted by fewer than one-third of these governments. Online delivery of government records had been adopted by one-fifth of local governments (21.3 percent). The penetration of the remainder of nonfinancial transactions onto local government Web sites ranged from a low of 2.4 percent for voter registration to a high of 15.7 percent for program registration.

Second, in four of the seven nonfinancial transactions for which data were available in both 2000 and 2002, substantial increases occurred in adoption during this two-year period. This was true for requests for services (from 18.1 percent to 33.3 percent), requests for records (from 14.9 percent to 32.2 percent), program registration (from 7.5 percent to 15.7 percent), and permit applications and renewals (from 4.9 percent to 11.4 percent). Only small increases occurred, however, in three cases—business licenses (from 3.3 percent to 5.8 percent), voter registration (from 2.0 percent to 2.4 percent), and property registration (from 1.0 percent to 3.3 percent).

Table 4 Online Service Adoption

	2000		2002	
	Number	Percent	Number	Percent
Nonfinancial transactions				
Request for service	284	18.1	587	33.3
Request for local government records	234	14.9	573	32.2
Interactive maps[a]	175	11.1		
Registration for programs[b]	118	7.5	272	15.7
Permit application or renewal[b]	77	4.9	201	11.4
Business license application or renewal[b]	52	3.3	101	5.8
Voter registration	31	2.0	40	2.4
Property registration	15	1.0	45	3.3
Delivery of local government records[c]			371	21.3
Download forms for manual completion[c]			1,064	65.8
Communication with individual elected and appointed officials[c]			1,271	76.1
	Number	Percent	Number	Percent
Financial transactions				
Payment of taxes	41	2.6	114	6.5
Payment of utility bills	35	2.2	105	6.1
Payment of license fees[d]	27	1.7		
Payment of tickets and fines[d]	26	1.7		
Payment of fines and fees[e]			98	5.6

[a]This question was not asked in the 2002 survey.
[b]There were slight wording differences in these questions between the 2000 and 2002 surveys.
[c]These questions were not asked in the 2000 survey.
[d]These questions were not asked in the 2002 survey.
[e]This question is a combination of the previous two questions for the 2002 survey.

Third, only a tiny minority of governments offered online financial transactions—only 5 percent to 6.5 percent of local governments reported offering online financial transactions—and the increases in adoption between 2000 and 2002 were modest at best.

There was a substantial increase in the number of local governments that planned to offer online services between 2000 and 2002. For example, 39.7 percent and 84.5 percent of local governments answered they would offer online permit applications within the next year in 2000 and 2002, respectively. This indicates that local governments have become more receptive to the demand and need for online services and are considering offering those services in the near future. However, data about local governments' plans to adopt online transactions should be viewed cautiously because the reliability of local governments' estimates is questionable (table 5).[10] In 2002, sizeable fractions of local governments reported they planned to adopt particular online transactions within the next year. Here are two representative examples—one each for nonfinancial and financial transactions.

In 2000, 28.4 percent of nonadopters said they would offer online requests for service within a year (table 5). This would have produced an adoption rate of 41.4 per-

Table 5 Online Services Planned

	2000		2002	
	Number	Percent	Number	Percent
Nonfinancial transactions				
Request for service	535	28.4	609	72.9
Request for local government records	493	26.2	536	63.5
Interactive maps[a]	520	27.6		
Registration for programs[b]	633	33.7	766	71.4
Permit application or renewal[b]	747	39.7	1029	84.5
Business license application or renewal[b]	614	32.6	874	72.3
Voter registration	194	10.3	234	21.5
Property registration	332	17.6	461	42.4
Delivery of local government records[c]			487	52.8
Download forms for manual completion[c]			451	83.1
Communication with individual elected and appointed officials[c]			176	58.5
	Number	Percent	Number	Percent
Financial transactions				
Payment of taxes	405	21.5	445	37.9
Payment of utility bills	580	30.8	709	58.2
Payment of license fees[d]	770	40.9		
Payment of tickets and fines[d]	559	29.7		
Payment of fines and fees[e]			798	66.0

[a]This question was not asked in the 2002 survey.

[b]There were slight wording differences in these questions between the 2000 and 2002 surveys.

[c]These questions were not asked in the 2000 survey.

[d]These questions were not asked in the 2002 survey.

[e]This question is a combination of the previous two questions for the 2002 survey.

cent (81.9 percent nonadopters x 28.4 plan to adopt = 23.3 percent + 18.1 percent adopters = 41.4 percent). In fact, by 2002, only 33.3 percent of local governments reported providing online requests for service—8 percentage points below what would have been expected from local governments' responses in 2000 (table 4).

Nearly one-third of nonadopters (30.8 percent) said they planned to offer online payment of utility bills. This would have produced an adoption rate of 32.3 percent (97.8 percent nonadopters x 30.8 percent plan to adopt = 30.1 percent + 2.2 percent adopters = 32.3 percent). In 2002, however, the actual increase was far smaller—3.9 percent or about seven and a half times *less* than would have been predicted by local governments' answers in 2000. These data lead us to conclude that, when measured by the number of online transactions available, most local government Web sites are relatively unsophisticated, although the trend is toward increased transactional capability (albeit gradually). There was, however, a large increase in the number of local governments that said they planned to offer online services.

Except for size, local government demographic characteristics were not uniformly associated with the adoption of online transactions (either at all or in the predicted directions). Size was positively associated with adoption (p = <.05 level or less) for all online transactions, which confirms previous findings that size is a predictor of IT adoption and innovation by local governments. Metropolitan status was positively associated with adopting online transactions in the predicted direction (p = <.05 or less) for utility bills, fines and fees, requests for records, registration for recreation programs, and downloadable forms. It was also positively associated with adoption, but in the opposite direction than predicted for paying taxes (central, independent, suburban), permits (central, independent, suburban), delivery of records (central, independent, suburban), and requests for services (suburban, central, independent).[11] No statistically significant relationships were found for metropolitan status and business licenses, voter registration, and property registration.

The remaining demographic characteristics were not associated with the adoption of online transactions consistently, if at all. The pattern of association between geographic region and transactions was different than predicted for nine transactions, and in four there was no statistically significant relationship. More often than not, type of government was either in a different direction than predicted (five cases) or not statistically significant (seven cases). Form of government was mostly not statistically significant. In eight of 13 transactions, city form was not statistically significant. For county form, it was not statistically significant for 12 of 13 transactions.[12]

Impact Dimension

The use of IT in government organizations has effects, some intended, others unintended, and some desirable, others undesirable. The evidence available from the literature today suggests that, for the most part, the use of IT in government organizations produces salutary results, although it is not without problems. Among other things, IT improves efficiency, accuracy, timeliness, and effectiveness; enhances jobs; makes work easier and more enjoyable; and extends workers' capacity to work. However, IT also supports existing organizational structures, including structures of power and authority. Typical problems with IT include difficulties with hardware, software, and vendors; poor or nonexistent training; and underutilization of system capabilities. Further, IT is not without costs, and the increased productivity resulting from IT may not be sufficient to offset its costs.[13]

Here, we have examined the perceived impacts of e-government on several aspects of local government administration. Both the 2000 and 2002 surveys asked how e-government has changed the responding local governments (table 6). The top impacts reported were the same

and in the same order in both surveys. Increased demands on staff led at 28.9 percent in 2002 (up almost 7 percent from 2000). Next came the changed role of staff (26.8 percent in 2002 versus 20.5 percent in 2000). This was followed by the reengineering of business processes (21.3 percent in 2002 versus 18.0 percent in 2000); business processes are more efficient (17.2 percent in 2002 versus 13.6 percent in 2000); and reduced time demands on staff (15.0 percent in 2002 versus 8.6 percent in 2000). Negligible numbers of governments reported reduced administrative costs, reduced staff levels, or increased nontax revenues as a result of e-government.

Table 6 Impacts

	2000		2002	
	Number	Percent	Number	Percent
Increased demands on staff	344	21.9	616	28.9
Changed role of staff	323	20.5	570	26.8
Business processes are being reengineered	283	18.0	453	21.3
Business processes are more efficient	214	13.6	367	17.2
Reduced time demands on staff	135	8.6	319	15.0
Reduced administrative costs	79	5.0	147	6.9
Reduced number of staff	11	0.7	23	1.1
Increased non-tax-based revenues	10	0.6	16	0.8

Perhaps most importantly, only minorities (in many cases, only tiny minorities) of local governments reported any impact at all. Evidently, most do not feel that e-government has reached a stage where it is producing noticeable impacts. These data also indicate, on the one hand, that e-government is producing some salutary results: improving business processes and reducing time demands on staff in growing minorities of local governments. On the other hand, the data also suggest that e-government has increased demands and has changed the role of staff, but it has not produced revenues.

It is still the early days in local government deployment of e-government, and therefore assessing its impacts may be premature. Nevertheless, these data provide at least a preliminary view of e-government impacts—a view that does not support claims of the types and levels of positive impacts based on the hype surrounding e-government.

Barriers to E-Government

The findings with respect to the input and impact dimensions suggest that most local government Web sites are not yet very sophisticated, at least as measured by the number of online transactions they feature. These findings also show that, thus far in the limited history of e-government, it has produced relatively few impacts, and not all of them are in the positive direction indicated by the hype surrounding this new technology. The obvious question is, why? Part of the answer can be found in data from the 2000 and 2002 surveys, in which respondents were asked whether their governments had encountered any of nine barriers to e-government (table 7). In 2002, only two barriers were reported by as many as half of the local governments (lack of technology or Web staff, 49.8 percent, and lack of financial resources, 46.7 percent). Other barriers reported by noticeable but smaller fractions of local governments in 2002 included issues regarding security (37.2 percent); lack of technology or Web expertise (31.6 percent); issues regarding privacy (29.2 percent); issues relating to convenience fees for online transactions (27.1 percent); and the need to upgrade technology (22.7 percent).

Table 7 Barriers to E-Government

	2000		2002	
	Number	Percent	Number	Percent
Lack of technology or Web staff	1,031	54.8	1,060	49.8
Lack of financial resources	840	44.7	993	46.7
Issues regarding security	652	34.7	791	37.2
Lack of technology or Web expertise	723	38.4	673	31.6
Issues regarding privacy	429	22.8	622	29.2
Issues relating to convenience fees for online transactions	409	21.7	576	27.1
Need to upgrade technology (PCs, networks, etc.)	525	27.9	483	22.7
Lack of information about e-government applications	438	23.3	303	14.2
Lack of support from elected officials	192	10.2	200	9.4

There are some notable differences in the local governments' responses between 2000 and 2002. First, the fraction of governments listing some of the barriers declined, including the lack of technology or Web staff (–5.0 percent) and the lack of technology or Web expertise (–6.8 percent), suggesting that local governments are increasing their staff in this important area. Also, 5.2 percent fewer governments said the need to upgrade their technology was a barrier, indicating their base level of hardware is less of a constraint than it was two years previously. On the other hand, the fraction of governments citing privacy, convenience fees, security, and lack of resources as barriers increased (6.4 percent, 5.4 percent, 2.5 percent, and 2.0 percent respectively). While none of these shifts is particularly dramatic, and they may be no more than artifacts of the two surveys (taken at different times and with different respondents—not all of the governments that responded in 2000 responded in 2002, and vice versa), the shifts may suggest that changes in the environment in which e-government is adopted are gradual. This can be seen particularly in regard to Web staff and expertise. As governments incrementally gain experience with e-government and as

that experience improves staff capacity, fewer governments perceive these as barriers to e-government, but issues such as security, privacy, and lack of financial resources remain or become significant constraints.

Conclusion

This comparison of data from two local e-government surveys leads to several conclusions. Overall, local governments in the United States continue to make incremental but consistent progress in adopting and deploying e-government. There is even an indication of increasing enthusiasm for e-government, evidenced by local governments' stated plans for adopting online services. First, we can conclude that most American local governments have Web sites, although most are eight years old or less at this writing. Second, the adoption of Web sites is strongly related to local government size, measured by population. Adoption is also related, although not as consistently, to other local government demographic characteristics, including type and form of government, metropolitan status, and region. Third, few local governments reported impacts from e-government, and not all of the reported impacts have been positive (such as increased work for staff) and some anticipated positive impacts have not occurred (such as revenue production, staff reductions, and lowered administrative costs).

Fourth, for the most part, local government Web sites, measured by the number of online transactions available, are not particularly sophisticated. However, while there is a discernable trend in the direction of adding more transactions (even if local governments' responses to questions about their plans to add such transactions are not fully reliable), the trend is clearly a slow one. Finally, local governments have encountered several barriers to the adoption of e-government. The most significant of these include a lack of technology or Web staff and expertise, lack of financial resources, and issues around privacy and security. Lack of technology or Web staff and lack of financial resources continue to be two major perceived barriers to e-government. While there has been a modest decrease in the portion of local governments that lack technology or Web staff and expertise, an increasing portion lack financial resources and experience other privacy- and security-related barriers to e-government.

These data enable some limited prognostication about the future of e-government in the near term among U.S. local governments. As has historically been true of IT adoption, more local governments will adopt e-government until nearly all local governments have Web sites that offer information and services. (Because nearly nine in 10 of these governments have Web sites today, the rate of future adoption can be expected to be slow.) Indeed, e-government should soon (if not already) be considered in the mainstream of local government service delivery.

As local government Web sites mature, they will become more sophisticated. That is, they will be more transactional, more integrated vertically and horizontally, and more likely to take on portal-type characteristics. However, the trend toward adopting more transactions is likely to remain slow. We also expect local government Web sites will move only gradually in the direction of integration and acting as a portal. For the next few years at least, most local government Web sites can be expected to remain mainly informational with limited transactional capabilities. And, as has been the case with IT in government in general, payoffs will lag adoption.

Electronic government is continually evolving. As many practitioners have said, e-government is a moving target. For this and other reasons, it is important that research continues to explore e-government adoption and impacts, particularly with longitudinal data from all levels of government as well as in-depth case studies of e-government initiatives. Continued research needs to keep pace with the practice and to gauge impacts of this dynamic, innovative, and relatively new IT, which, according to many, has such great potential to transform government service delivery and the very face of government itself.

Notes

1. See, for example, Cohen and Eimicke (2001), Ho (2002), Kaylor, Deshazo, and Van Eck (2001), Moon (2002), Norris (2003a), Norris, Fletcher, and Holden (2000), Pardo (2000), Scavo (2003), Schelin (2003), Stowers (1999, 2001), and West (2000, 2001a, 2001b). See also Smith (2002) and Moulder (2003), which report on the 2000 and 2002 ICMA/PTI surveys, respectively. These and other studies examine a variety of aspects of e-government.
2. There are obvious limitations to using only two data points separated by only two years. In particular, the time frame is very short, and it may not be possible to detect significant trends over such a short period. However, e-government at the local level in the United States is a relatively new phenomenon, and nationwide e-government surveys of local governments have been conducted only since 2000.
3. The technology acceptance model often examines individual-level determinants of IT acceptance and use. For example, Venkatesh and Davis (2000) suggest that individual technological acceptance (perceived usefulness and useful intention) is determined both by social influence processes (individual norms, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use).
4. With the exceptions noted later, these are the standard categories or classifications the ICMA uses in its annual *Municipal Yearbook* and are contained in its survey data sets. In terms of population, the ICMA uses nine classifications. We combine those into three classifications for ease of statistical analysis. The classifications small, medium, and large, respectively, contain 2,677, 2,636, and 272 local governments with populations greater than 10,000 (ICMA 2003, xii–xiii). This is the total—the actual number of respondents in each category was less than the total. With respect to region, the ICMA data set employs both the nine standard Census Bureau geographic divisions and aggregates those divisions into four larger geographic regions. For ease of statistical analysis, we chose to use the latter. These population and geographic classifications have been successfully used by scholars in several prior studies (Kraemer and Norris 1994; Norris and Kraemer 1996; Norris and Demeter 1999; Norris and Campillo 2003; Holden, Fletcher, and Norris 2003).
5. This does not appear to be a significant departure from the predicted direction of the relationship and may be more of an artifact of the methodology than an indicator of anything substantive.
6. This is empirically consistent with the first stage of e-government described by Layne and Lee (2001).
7. This observation adds at least one level to Layne and Lee's model of e-government and, based on data from focus groups conducted by one of the authors (Norris 2003a), appears to be more empirically accurate. This is because horizontal and vertical integration can occur on a Web site without the development of a portal capability. Moreover, portal capability has not yet arrived on most local government Web sites. Additionally, it is clear that the progression through this model—regardless of the number of levels—is not necessarily linear. For example, some late adopters have moved directly into integration and transactional capability with only a brief stop, if one at all, at brochureware.
8. Although there are other ways to measure site sophistication (such as visual appeal, internal navigability, extent of integration, portal capability, etc.), the ICMA/PTI survey data only examined transactional capability.
9. The 2002 survey included a question about communication (presumably e-mail). Other studies (Norris and Demeter 1999) show that most local governments have provided e-mail capability for years and, thus it is a mainstream feature of e-government. Consequently, we chose not to include communication as a transaction with the same meaning as paying water bills or registering for recreation programs, which are truly interactive.
10. This is a repeat of the phenomenon that occurred with respect to local governments' plans to adopt Web sites.
11. However, for all but requests for services, governments in the central region were more likely to adopt than suburban or independent governments, as predicted.
12. Because of the lack of reliability of the "plans to" answers, we did not run tests of statistical significance between local government demographic variables and online transactions.
13. See, for example Kling (1978), Kraemer, Dutton, and Northrop (1981), Danziger and Kraemer (1986), Northrop et al. (1990), Kraemer and Norris (1994), Norris and Kraemer (1996), Bailey (1991), Kraemer and Dedrick (1997), and Norris (2003b).

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