

# Explaining the Varying Levels of Adoption of E-government Services in American Municipal Government

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## Abstract

Technological innovations offer opportunities for governments to connect with citizens and improve service provision efficiency and effectiveness, but why do some governments adopt these innovations while others do not? Using a mixed methodological approach, including interviews with city officials and multivariate analysis of a novel data set of municipal e-government service offerings, we examine what factors motivate or impede city officials from innovating. Overall, we find that cities with the council–manager form of government, with larger populations, and with more financial resources adopt more e-government services. Specifically, as total revenue per capita increases, cities are more likely to adopt payment-based services and informational services. Increased spending on central staff is associated with higher rates of adoption of interactive services and social media. The results suggest that council–manager governments are more innovative and that local governments consider both the up-front costs and the need for ongoing staff associated with particular innovations.

## Keywords

local government, e-government, form of government, public administration

Technological innovations offer the possibility for citizens to have unprecedented, around-the-clock access to local governments. Generally defined, e-government is the use of information and communication technology by governments to disseminate information and services (Norris and Demeter 1999). E-government is one component in the broad effort of emerging smart cities to utilize data and apps to provide more analytically directed management of government services (Nam and Pardo 2011; Chourabi et al. 2012; Albino, Berardi, and Dangelico 2015).

E-government tools have the potential to allow residents to more easily access government documents, monitor government behavior,

and communicate with officials (Meijer 2009; Aikins and Krane 2010). These tools may also increase transparency, promote citizen participation, reduce administrative burdens (Mossberger, Tolbert, and Franko 2013), and

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enhance trust in government (Hood 2006). Today, almost all municipalities have websites, yet the variety of services available to citizens on those websites varies greatly. Information services, including downloadable documents and e-newsletters, are becoming standard. Tools that allow citizens to pay for various fees, taxes, and fines are also popular, though not ubiquitous. Other services are far from widespread. For instance, local governments use social media unevenly; the adoption of Facebook and Twitter is common, while other social media platforms are used minimally. Politicians and administrators in each city decide which e-government tools to adopt, and these choices directly impact the lives of residents and their relationship with their local government. The benefits of e-government have been widely discussed, but this study examines which types of e-government services municipalities tend to offer and why some cities offer more e-government services than others.

While prior research has examined the factors associated with local government adoption of e-government services as a group, this study moves further by using a mixed methods approach to explain how four key factors (resources, form of government, population, and citizen demand) impact municipal adoption of four different types of e-government tools (informational, payment based, social media, and interactive services). The findings suggest that the relationship between these four key factors and e-government adoption varies depending on which type of e-government service is considered.

This study begins with a description of the prior research on government innovation and some predictions for local e-government adoption. Next, there is a description of the mixed methodological approach, which employs both empirical quantitative analysis and interviews with city officials to examine how various municipal-level factors impact the adoption of different types of e-government services. The article concludes with a discussion of the

results and their implications for practitioners and for future research.

## **The Impact of Key Factors on E-government Adoption**

The likelihood that technological innovations spread depends on the characteristics of both the innovation and the potential adopter (Rogers 2003; Walker 2006; Berry and Berry 2004). Because technological innovation is often costly and may have both advantages and drawbacks associated with it (Druckman, Kifer, and Parkin 2009), political actors and public managers go through a decision-making process in which they must carefully decide whether to incorporate new technologies into their organization.

While prior research often broadly defines innovation, this study considers how four key factors (resources, form of government, population, and citizen demand) impact overall e-government adoption and the adoption of specific types of e-government tools by municipal governments in the United States. The key contribution of this study is that the impact of each of these factors on e-government adoption varies depending on the type of e-government tool in question. Each of the factors considered in this study is described in detail in this section.

### **Resources**

Several studies find that the greater an organization's resources or personnel capacity, the more likely they are to adopt new technologies (Goode and Stevens 2000; Ho 2002; Rogers 2003; Walker 2006; Li and Feeney 2014). Other studies find that resource constrained municipalities may view innovation as a cost-savings measure (Godwin 2014; International City/County Management Association [ICMA] 2016). According to a 2016 ICMA survey, 93 percent of cities report that the potential for budget savings is a significant or very significant factor in the motivation to innovate. It is possible that municipalities with more resources are better able to adopt e-government tools, but it is also possible that municipalities

with fewer resources are more likely to turn to e-government tools as a means of cost savings or efficiency gains. Further, resources (both financial and staff capacity) may play a different role in the adoption of services with low up-front costs but relatively high labor intensity (such as social media services) than for services with high up-front costs but lower long-term costs (such as informational services). This study seeks to better understand how municipal resources and staff capacity impact the adoption of e-government tools in general and each of the four specific categories of e-government tools.

### *Form of Government*

The council–manager form was designed to address corruption and inefficiency in local government by placing an apolitical professional at the helm of the organization (Feiock et al. 2003). Advocates of the council–manager form suggest that city managers, by virtue of their distance from politics and their professional training in effective and efficient government, may be more likely to implement innovative policies that lead to efficiency gains in local government. City managers, unlike elected mayors, face pressure to perform in accordance with professional norms in order to appeal to future councils they may work for, and prior work suggests appointed public managers consider these career pressures in the decisions they make (Connolly 2017; Teodoro 2011, 2013).

Some scholars find that council–manager governments are more innovative than municipalities with other forms of government (Moon and deLeon 2001; Damanpour and Schneider 2008; Krebs and Pelissero 2010; Brudney and Selden 1995; Nelson and Svava 2012; Kwon, Berry, and Feiock 2009). Others have found that the council–manager form does not impact the adoption of productivity improvement strategies (West and Berman 1997) or policy outcomes (Moon and Norris 2005; Carr and Karuppusamy 2010; Morgan and Kickham 1999; Hayes and Chang 1990).

Despite the extensive scholarship on the impact of municipal government form on local

policy outcomes and innovation (Carr 2015), there are two reasons for further analysis. First, most studies broadly define innovation to mean the adoption of *practices or policies* that are new to the organization rather than the adoption of new *technologies* or, more specifically, e-government tools. Second, most of these studies were conducted before smartphones and residential high-speed Internet access were commonplace throughout the United States. These important changes in the quality and form of Internet access likely affect the adoption of e-government tools by local government. This study starts to explore how.

### *Municipality Size*

Municipal characteristics (such as population size) may also play a role in government innovation. Previous large-scale studies have shown a positive relationship between organizational size and innovation (Damanpour 1992; Rogers 2003; Camisón-Zornoza et al. 2004), including information technology (IT) innovation (Lee and Xia 2006). Studies that specifically evaluate e-government innovation consistently find links between population size and e-government adoption (Kaylor, Deshazo, and Van Eck 2002; Moon 2002; Holden, Norris, and Fletcher 2003; Norris and Reddick 2013). This study seeks to examine whether there is a positive relationship between municipal population size and the adoption of different types of e-government tools.

### *Citizen Demand*

Finally, citizen demand may impact the decision to adopt new e-government services (Layne and Lee 2001). There is evidence that more frequent web use is connected to higher demand for e-government (Gauld, Goldfinch, and Horsburgh 2010) and that greater access to the Internet increases e-government use (United Nations 2016). Further, a 2016 ICMA survey finds that 66 percent of cities surveyed say pressure from citizens motivates new initiatives and innovations, though not specifically e-government services (ICMA 2016). Another

recent survey suggests that among U.S. cities, the top priority for smart city projects is increasing citizen satisfaction (U.S. Conference of Mayors 2016). This study seeks to better understand the nature of the relationship between local citizen demand for technology and local government adoption of different types of e-government tools.

## Data and Method

The original data set used in this study includes data from cities across the country on their e-government service provision and their political, economic, technological, and demographic characteristics. A random number generator facilitated the selection of eighty-three cities, encompassing over 10 percent of American cities with populations over 50,000 (see Online Supplemental Table S1). The study includes only cities with a population of 50,000 or more as municipal-level data are often difficult to gather for smaller cities and towns.<sup>1</sup> While many cities in the United States do have smaller population sizes, more than 70 percent of U.S. residents live in an urbanized area of 50,000 or more people. The sample includes cities from all regions and closely approximates national averages for median income and poverty rates for the nation overall (U.S. Census Bureau, American Fact Finder).<sup>2</sup>

As part of a mixed methodological approach, the researchers interviewed the city manager, communications director, or IT director for seven cities (Scottsdale, AZ; Margate, FL; Santa Monica, CA; Lakeville, MN; Port St. Lucie, FL; North Richland Hills, TX; and New York City, NY) in the sample (see Online Supplemental Text 1). These seven cities vary a great deal in e-government services offered and in key demographics including population size, median household income, and poverty rate. The e-government services offered by these seven cities spans nearly the entire spectrum from nine services (Margate, FL) to twenty-three services offered (Santa Monica, CA).

This original data set is used to examine the relationship between four key factors (resources, form of government, population, and citizen

demand) and the adoption of e-government tools broadly and the adoption of specific types of e-government tools (information based, payment based, social media, and interactive or two-way communication services).

The researchers created an original data set of the types of e-government services available from the official municipal website of each city in the sample in August 2014. The data were collected in 2014 because this was a period of broad deployment of Internet access to U.S. residents. Between 2012 and 2014, the number of Americans without access to both fixed broadband and mobile broadband fell by more than half, from 72.1 million to 34.5 million, meaning that nearly 90 percent of U.S. residents had both residential and mobile broadband access by 2014 (Federal Communications Commission 2018). For a full description of the data collection methods and a list of each e-government service included in the data collection effort, see Online Supplemental Text 2.

## Dependent Variables

The first key dependent variable is *percentage of total e-government services offered* (of thirty-one possible services). The average city in the sample offers approximately fifteen e-government services, about half of the thirty-one services we analyze. The remaining dependent variables are focused on specific categories of e-government services.

The *percentage of interactive services* is a continuous variable calculated as the percentage of interactive services offered by a given city of twenty-seven possible services. When considering clusters of e-government offerings, it is notable that among twenty-seven interactive features available, the average municipality in the sample offers only 8.7 (32 percent). The *percentage of informational services* is a continuous variable calculated as the percentage offered of sixteen possible services. An ordinary least squares regression model is estimated for each of these dependent variables. The *number of payment services* is an ordinal-level variable. Given that there were only four payment service options, each city is coded as

having zero, one, two, three, or four payment services. Therefore, this variable is treated as an ordinal-level variable, and we estimate an ordered logistic regression of *number of payment services*. Our final dependent variable is a count measure of *social media services* adopted. Given the nonnormal, right-skewed distribution of the data, we estimate a negative binomial regression model of social media services. While 12 percent of the sample lacks any social media presence, about 59 percent of cities make use of at least one social media platform.

### Independent Variables

This study uses two measures of municipal resources. The first is *total revenue* per capita, a measure of the total municipal revenue per capita in thousands of dollars from all sources in 2012 (collected from RAND Local Government Database<sup>3</sup>). This variable is included to account for the overall fiscal capacity of a local government. It includes all sources of revenue (both own source and grants-in-aid) as any revenue at the local government's disposal enhances the overall fiscal capacity of the local government. The second measure of municipal resources is *central staff services* per capita, a measure of the municipality's expenditures per capita in thousands of dollars on central staff services in 2012, also from RAND. This measure captures the staff capacity of a local government separate from its total monetary resources.<sup>4</sup>

Form of government is measured as whether or not the city has a *council-manager* form of government. For each city in the study, this is a dummy variable coded as 1 if the municipality operates under the council-manager form of government and 0 if other (gathered from each city's website or city charter). In this study, the municipal *population (ln)*, measured as the natural log of the 2012 municipal population, is included in all analyses.

Local government officials' perception of citizen demand for e-government tools can be difficult to measure objectively, and in the absence of reliable data directly measuring

citizen demand for e-government tools at the municipal level, this study uses two proxies for citizen demand (from the perspective of local decision makers). The first proxy for citizen demand is the percentage of households within the metro area with *access to high-speed Internet* (from the National Telecommunications and Information Administration 2014). Just because a resident has high-speed Internet does not mean he or she is necessarily more likely to use municipal e-government services. However, local government officials may view a population with low levels of high-speed Internet access as one less likely to make use of municipal e-government services.

As a second proxy for citizen demand, the study includes the *percentage of the population aged eighteen to sixty-five* (U.S. Census). This measure, rather than median age, is included for several reasons. While approximately 84 percent of U.S. adults are Internet users, only 58 percent of senior citizens use Internet (Perrin and Duggan 2015), and even fewer (47 percent) senior citizens have broadband at home (Horrigan and Duggan 2015). Children under the age of eighteen have little reason to request services from their local government separate from their parents, even if they have access to Internet. In other words, the percentage of residents between eighteen and sixty-five is a proxy for the percentage of the population that local officials might expect to be interested in or likely to make use of e-government tools. Put differently, a local official representing a city in which 40 percent of the population is between eighteen and sixty-five might approximate citizen demand for e-government tools to be much lower than a local official representing a city in which 80 percent of the population is between eighteen and sixty-five.<sup>5</sup>

### Results

The results of the analysis, both of the adoption of all e-government tools and the adoption of specific types of e-government tools are summarized in Table 1.

This table shows whether and how each of the key factors examined in this study is

**Table 1.** Impact of Key Factors on Municipal Adoption of Types of E-government Tools.

Factors	Overall	Interactive	Info	Payment	Social Media
Total revenue per capita	+		+	+	+
Central staff services per capita	+	+			+
Council–manager form	+	+	+	+	
Population size	+	+	+		+
Internet access					
Percentage of the population aged eighteen to sixty-five	+	+		+	+

Note. Directionality of association shown only for statistically significant associations at  $p < .10$  level.

associated with the adoption of e-government tools overall and the adoption of specific types of e-government tools. The results show that larger cities, those operating under the council–manager form of government, those with more total revenue per capita and greater expenditures on central staff per capita, and those with a greater proportion of residents between the age of eighteen and sixty-five, have higher levels of e-government innovation overall.

This study includes two separate analyses—one of the adoption of specific types of e-government tools and one of the adoption of all e-government tools. The results of the analysis of all e-government tools are presented in Table 2 and the results of the analysis of specific categories of e-government tools are presented in Table 3. A full table of descriptive statistics for all variables included in the analysis can be found in Online Supplemental Table S2 and Supplemental Text 3.

The first model (see Table 2) examines how the four key factors (resources, form of government, population, and citizen demand) impact the *percentage of total e-government services offered* (of thirty-one possible services). This broad category includes all e-government services that were included in the study (and in the prior four categories of e-government services) and provides a useful comparison for each of the four specific service categories already described. It is important to note that some e-government tools that straddled more than one category were counted in multiple categories. For instance, some financial services are included in both the interactive and payment e-government tool categories.

**Table 2.** Ordinary Least Squares Regression Model: Percentage of Total Online Services (of 31) Offered.

Variables	Percentage of Total Online Services
Population (ln)	8.087*** (1.601)
Council–manager	6.005** (2.338)
Total revenue per capita (in thousands)	1.655** (0.714)
Central staff services per capita (in thousands)	18.058** (7.912)
Poverty rate	–10.359 (19.117)
Percentage of the population that is white	0.181** (0.067)
Percentage of the population aged eighteen to sixty-five	0.726** (0.275)
Percentage with high-speed Internet	0.280 (0.285)
Constant	–133.617*** (27.354)
N	81
Prob. > F	.000
R <sup>2</sup>	.469
Adjusted R <sup>2</sup>	.410

Note. Standard errors clustered on the state are in parentheses.

\* $p < .10$ .

\*\* $p < .05$ .

\*\*\* $p < .01$ .

There is a great deal of variation in the total number of e-government services offered, but what factors impact the adoption of e-government services? The models suggest that as municipal resources increase, measured as the total revenue per capita, the percentage of all e-government services offered also increases (see Table 2). Holding all other variables at their mean, a US \$1,736 increase in total revenue per capita (1 standard deviation)

is associated with one additional e-government service being offered. An increase in spending on central staff services per capita is also positively associated with e-government adoption. All else equal, a city that spends US \$277 on central staff services per capita (2 standard deviations above the mean) will offer approximately one more e-government service than a city that spends \$73 on central staff services per capita (the sample mean).

There is evidence that council–manager cities are more innovative than cities with other forms of government. The model predicts that all else equal, a city operating under the council–manager form of government will offer about two more e-government services than a city operating under other forms of government. In general, as total revenue per capita increases, so too does e-government adoption, but council–manager cities increase their e-government adoption at a faster rate than other cities as their total revenue per capita increases.

The results also suggest that population size is significantly and positively associated with the percentage of all e-government services offered. Substantively, the model predicts that holding all else equal, a municipality with a population 1 standard deviation above the mean would offer about three more e-government services than a city with a population 1 standard deviation below the mean.

In terms of the impact of citizen demand on e-government adoption, the percentage of households in the metro area with high-speed Internet access is not related to the percentage of e-government services offered. However, as the percentage of residents aged eighteen to sixty-five increases so too does the adoption of e-government services. A city in which 73 percent of residents are between the ages of eighteen and sixty-five (2 standard deviations above the mean) is expected to offer about two more e-government services than a city in which 64 percent of residents are between the ages of eighteen and sixty-five (the mean of the sample).

However, the central contribution of this study is to examine how these key factors impact the adoption of specific types of e-government

services. To predict local-level adoption of these specific types of e-government services, four additional models are estimated (see Table 3). As expected, the results suggest that the impact of the four key independent variables on e-government service adoption depends on the specific e-government service category under consideration. Next, the study examines each of these four specific types of e-government services individually.

### *Informational Services*

The study includes a measure of the *percentage of informational services* (a continuous variable calculated as the percentage of sixteen possible services) offered by each city. Some examples of informational services include streaming video of meetings, e-newsletters, online agendas or minutes, downloadable forms, and interactive maps. The average municipality offers 54 percent of all informational features. Unsurprisingly, informational features are the most prominent of all four types of e-government services, perhaps because providing information online saves city staff time versus responding individually to requests for information. An ordinary least squares regression model is used to model the *percentage of informational services* offered.

Specifically, with regard to informational services, the results suggest that cities operating under the council–manager form of government, with larger populations, and higher total revenue per capita offer a greater percentage of informational e-government services. It is worth noting that for informational services, total revenue per capita, but not central staff services expenditures per capita, is associated with the percentage of services offered. Thus, the resources needed to increase informational e-government services may be for initial setup or maintenance but not long-term additional staffing. Neither Internet access at home nor the percentage of the population aged eighteen to sixty-five is associated with the adoption of informational services.

**Table 3.** Ordinary Least Squares Regression Models, Logistic Regression Model, and Negative Binomial Regression Model of Specific Service Categories.

Variables	Percentage of Interactive Services	Percentage of Informational Services	Total Payment Services	Social Media
Population (ln)	6.996*** (1.480)	9.642*** (2.074)	-0.141 (0.339)	0.243** (0.102)
Council–manager	3.796* (2.113)	8.568*** (2.737)	1.323*** (0.472)	0.249 (0.189)
Total revenue per cap (in thousands)	0.911 (0.591)	2.389** (0.871)	0.504*** (0.123)	0.012 (0.038)
Central staff per cap (in thousands)	25.441*** (6.476)	13.730 (10.468)	-0.636 (1.747)	0.827*** (0.317)
Poverty	-13.726 (14.479)	3.415 (26.171)	1.189 (3.178)	0.069 (0.885)
Percentage of the population that is white	0.048 (0.063)	0.313*** (0.111)	-0.008 (0.011)	-0.003 (0.003)
Percentage of the population aged eighteen to sixty-five	0.717*** (0.238)	0.541 (0.391)	0.139** (0.054)	0.015* (0.009)
Percentage of high-speed Internet	0.268 (0.238)	0.210 (0.376)	-0.006 (0.033)	0.006 (0.018)
Constant	-123.161*** (22.285)	-141.839*** (40.208)		-3.748** (1.457)
Ln( $\alpha$ )				-51.571
N	81	81	81	81
R <sup>2</sup> or prob. > X <sup>2</sup>	.477	.410	.000	.000
Adjusted R <sup>2</sup> or psuedo R <sup>2</sup>	.419	.344	.108	.045

Note. Standard errors clustered at the state level are in parentheses.

- †p < .15.
- \*p < .10.
- \*\*p < .05.
- \*\*\*p < .01.

### Payment Services

The study includes a measure of the *number of payment services*. There were four possible e-government tools classified as payment services: pay a ticket/fine, pay taxes, pay utility bill, and pay license/permit. Given that there were only four payment service options, each city is coded as having either zero, one, two, three, or four payment services. Because this variable is treated as an ordinal-level variable, an ordered logistic regression is estimated for the *number of payment services*.

Operating under the council–manager form of government, total revenue per capita, and the percentage of residents aged eighteen to sixty-five are all significantly and positively associated with the number of payment services offered. Proponents of the council–manager form of government often argue that

managers will seek efficiency gains; perhaps these results are evidence of this. Additionally, as most online payment services are automatic and require little ongoing staff engagement or follow-up, it is not surprising that total revenue per capita but not central staff services is positively related to offering online payment services. The percentage of residents between the ages of eighteen and sixty-five is also positively associated with offering payment-based e-government services. However, unlike the other three service categories, population size is not significantly associated with the number of payment services offered. Given that payment services are the only service category which directly bring in revenue for the local government, it is not surprising that local governments adopt these services regardless of population size or staff capacity.

## Social Media Services

The study includes a count measure of *social media services* adopted. Examples of social media services offered include Instagram, Nextdoor, Facebook, and Twitter. While 12 percent of cities included in the sample lack any social media presence, about 59 percent of cities make use of at least one social media platform. Given the nonnormal, right-skewed distribution of the data, a negative binomial regression model of *social media services* is estimated.

Population, total revenue per capita, central staff services expenditures per capita, and the percentage of the population between the ages of eighteen and sixty-five are all positively associated with adopting more social media platforms, but percentage with high-speed Internet and the council–manager form are not associated with social media offerings. Social media is the only service category for which council–manager cities are not more innovative.

## Interactive Services

The final category for e-government services is the *percentage of interactive services* (a continuous variable calculated as the percentage offered of twenty-seven possible services). Some examples of interactive services include online communication with an office holder, registration for parks and recreation programs, a permit application, or a request for services. When considering clusters of e-government offerings, it is notable that among twenty-seven interactive features available, the average municipality in the sample offers only 8.7 (32 percent). An ordinary least squares regression model is estimated for the *percentage of interactive services*.

With regard to interactive services, city population size and operating under the council–manager form of government are significantly and positively associated with the percentage of interactive e-government services offered. However, in terms of city resources, central staff services expenditures per capita, but not total revenue per capita, are significantly and

positively associated with the percentage of interactive services offered. The percentage of the population between the ages of eighteen and sixty-five, but not the percentage of households with high-speed Internet, is also associated with the percentage of interactive services offered.

## Qualitative Interview Findings

The reflections of several city officials provide face validity to the empirical results. In line with the empirical results, public officials believe that resources and citizen demand for access to government are key factors in e-government adoption. Justin Miller, City Administrator of Lakeville, MN, said:

Well, cost is always the first [barrier]. And then, it is a little bit of a chicken and egg syndrome in that you don't want to necessarily adopt a technology before a lot of people are using it. But at the same time people aren't going to be using it unless you have a reason for them to download the app or to go there in the first place.

Jory Wolf, Chief Information Officer of Santa Monica, CA, explains that e-government adoption can lead to cost savings and a decrease in the time required to collect own-source revenue:

There are a lot of cost savings, when it comes to say online transactions . . . . When it comes to online fee for service transactions, like special bills, parking citations, water and refuse, utilities and bills, and the like . . . especially when they are handled through credit cards, are saving considerable amounts of money over the manual processing that we used to have to do. We, of course, get the revenue much faster.

In discussing staff capacity and resources, Fritz Behring, City Manager of Scottsdale, AZ, says:

I mean, do you know when we make things easier to do online, they can actually generate more work [for city staff] and so to save money, that would be the other way.

Mark Hindman, the City Manager of North Richland Hills, TX, suggests that his city chose to offer e-government not only for efficiency gains but also to meet citizen demand for such services:

There is a technology tool that allows us to deal with declining revenues or stagnant revenues or increasing expenses . . . it's meeting the demands of our crux of the day that wants to have information at your fingertips, wants to be able to go out and look at information and get it now, get it at any time, and not have to wait for office hours or an appointment or come in and pick up a form or anything of that nature. It's a two-edge sword that helps for efficiency and also it helps in the convenience for the citizens.

These officials pointed to resources, specifically up-front funding and ongoing staff time, as important factors in deciding whether to adopt specific types of e-government. However, the empirical results suggest that the role of resources varies depending on whether the e-government service in question requires a significant up-front investment of time or money or whether the service requires little up-front investment and the ongoing investment of resources and staff time. That central staff services expenditures per capita is associated with the adoption of interactive services and social media services in the empirical models further suggests that staff capacity is a particularly important factor for local governments in deciding whether to adopt services that require the ongoing investment of staff time.

## Discussion and Conclusion

This study offers strong evidence that municipal population size, municipal resources, and the percentage of municipal residents between the ages of eighteen and sixty-five are all positively associated with the adoption of e-government tools. Additionally, council-manager governments are more innovative in so far as they are more likely to have adopted more e-government tools.

The link between resources and e-government adoption suggests that the notion that more resources lead to higher levels of e-government adoption is overly simplistic. Total revenue per capita is associated with certain categories of services, while central staff service expenditures are associated with different categories of services. While informational services, such as the ability to download the city charter, and payment services, such as the ability to pay a ticket online, require an initial exertion of staff time and resources, little additional staff time is needed once functionality is enabled on the city website. On the other hand, interactive services, which include online permit applications, requests for services, online communication with officials, and social media platforms, require ongoing allocation of staff time and resources to provide. In other words, informational, payment, and interactive e-government services form technology clusters that differ in the types of resources required to adopt and maintain them and the perceived benefits and risks involved (Tornatzky and Klein 1982; Rogers 2003; Teng, Grover, and Guttler 2002). The qualitative and quantitative findings are complementary in this respect—the quantitative findings suggest a role of resources in adoption of services, and the interview data further suggest that cities are being strategic in these choices.

Further, it is possible that cities with online payment services are better able to collect revenue, rather than revenue per capita impacting the decision to offer online payment services. In fact, one of the officials interviewed mentioned that the adoption of online payment services allowed the city to collect revenue more quickly. Future research should seek to better understand the role of resources in e-government adoption and to separate resource-related barriers to adoption versus the impact of adoption on resources.

Citizen demand may also be a key factor impacting a local government's decision to adopt e-government innovations. The city officials interviewed for this study express a clear desire to meet citizen demand. As James Wilbur, Information Technology Director for the

city of Margate, FL, puts it, the city “wanted to do this [expand online services] because the citizens were asking them for it.”

However, even though some cities seek to meet citizen needs, they are often not fully aware of what those citizen needs are. Many cities feel that with regard to citizen demand, they are taking a “leap of faith” in adopting new technologies and hoping that citizens will use them. This reflects the difficulty in empirically measuring citizen demand for e-government, which has led both scholars and city officials to conclude that if cities build it, citizens will come.

In several models, the percentage of the municipal population between the ages of eighteen and sixty-five is significantly and positively associated with e-government service adoption. This may reflect an underlying reality that older citizens do not demand e-government as vocally as younger citizens. Or, it may be that government officials make assumptions—practically, given that 34 percent of those over sixty-five are not online (Anderson and Perrin 2018)—about older citizens’ likelihood to use such services. The level of high-speed Internet access in a city, one rough proxy for citizen demand, is not significantly related to the adoption of any category of e-government service. This result does not necessarily mean that citizen demand plays no role in the adoption of e-government services, but rather that, in the future, surveys of citizens to gauge demand for such e-government tools would likely prove instructive.

Researchers should also examine e-government innovation in smaller cities, as this study includes only cities with a population greater than 50,000 people. City officials consistently mentioned citizen demand as a driving factor in e-government decision-making; however, their perception of citizen demand is often based on interviews and casual conversations with citizens. Further systematic research on citizen demand for e-government services is needed, particularly given that ubiquitous smartphone use and mobile Internet access could impact citizen demand in substantial ways. It is worth noting that given the relatively

small sample, it is possible that this study fails to find significant relationships that do exist. Future research should repeat these efforts with a more robust sample.

The models include a control variable for the percentage of the population that is white, and the result that this variable is significantly and positively associated with e-government adoption warrants further analysis. If cities with larger minority populations are offering fewer e-government services than their peer cities with smaller minority populations, this echoes other types of documented racial inequality in American cities (O’Connor, Tilly, and Bobo 2001).

Operating under the council–manager form of government is significantly associated with the percentage of services offered, both overall and in three of the four e-government service categories. Results also suggest that even as fiscal capacity increases, council–manager governments are more likely to make use of additional resources to innovate and adopt additional e-government services than other governments. This offers strong support for the proposition often made by advocates of the council–manager form of government that the appointed professional manager will be more innovative and more aggressive in seeking efficiency gains in municipal operations than an elected executive.

Scholars of policy innovation have described the ways in which policy innovation may occur through diffusion; innovations may spread among individual governments through the processes of learning from, imitation of, normative pressure from, competition with, or coercion by other governments (Berry and Berry 2014). The original data set used in this study only includes information on factors internal to each municipal government, but future work could consider how policy diffusion might impact the adoption of e-government tools by municipal governments.

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## Supplemental Material

Supplemental material for this article is available online.

## Notes

1. The U.S. Census Bureau defines “urbanized areas” as those with 50,000 or more people, and the American Community Survey does not report annual data for cities with a population of 20,000 or fewer.
2. Our 2014 sample was selected randomly from all cities with a population over 50,000 but did result in an oversampling from California. Our sample is made up of 21.7 percent Californian cities, while only 12 percent of cities in the United States with a population of 50,000 people or more are in California. The Californian cities have a mean population of 208,927, while the sample has a mean population of 139,238. The California cities have a median income of US \$74,413, the sample has a median income of US \$58,375.
3. See [http://www.randstatestats.org/us/stats/local\\_government\\_finances.html](http://www.randstatestats.org/us/stats/local_government_finances.html).
4. Data on revenue and expenditures are missing for two cities (Sunrise, FL, and Port St. Lucie, FL) in the original sample of eighty-three, thus the usable sample for the purposes of our analysis is eighty-one.
5. From the perspective of local officials predicting how likely their residents are to use e-government tools, the percentage of residents between eighteen and sixty-five is a better proxy for demand than median age. For example, consider two cities that both have a median age of forty-five. One might have only 25 percent of their residents in the range of eighteen to sixty-five, while the other might have 75 percent in that range despite identical median ages. These two cities are quite different demographically, though this would not be reflected in the median age.

## References

- Aikins, Stephen K., and Dale Krane. 2010. Are public officials obstacles to citizen-centered e-government? An examination of municipal administrators’ motivations and actions. *State and Local Government Review* 42:87–103.
- Albino, Vito, Umberto Berardi, and Rosa Maria Dangelico. 2015. Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology* 22:3–21.
- Anderson, Monica, Andrew Perrin, and Jingjing Jiang. 2018. *11% of Americans don’t use the internet. Who are they?* Washington, DC: Pew Research Center. <http://www.pewresearch.org/fact-tank/2018/03/05/some-americans-dont-use-the-internet-who-are-they/> (accessed October 9, 2018).
- Berry, Frances Stokes, and William D. Berry. 2014. Innovation and diffusion models in policy research. In *Theories of the policy process*, eds. Paul A. Sabatier, and Christopher M. Weible, 307–59. Boulder, CO: Westview Press.
- Brudney, Jeffrey L., and Sally Coleman Selden. 1995. The adoption of innovation by smaller local governments: The case of computer technology. *The American Review of Public Administration* 25:71–86.
- Camisón-Zornoza, Cesar, Rafael Lapiedra-Alcamí, Mercedes Segarra-Ciprés, and Montserrat Boronat-Navarro. 2004. A meta-analysis of innovation and organizational size. *Organization Studies* 25: 331–61.
- Carr, Jered B. 2015. What have we learned about the performance of council-manager government? A review and synthesis of the research. *Public Administration Review* 75:673–89.
- Carr, Jered B., and Shanthi Karuppusamy. 2010. Reassessing the link between city structure and fiscal policy: Is the problem poor measures of governmental structure? *The American Review of Public Administration* 40:209–28.
- Chourabi, Hafedh, Taewoo Nam, Shawn Walker, J. Ramon Gil-Garcia, Sehl Mellouli, Karine Nahon, Theresa A. Pardo, and Hans J. Scholl. 2012. Understanding smart cities: An integrative framework. In *Proceedings of the 2012 45th*

- Hawaii International Conference on System Sciences*, 2289–97. IEEE.
- Connolly, Jennifer M. 2017. The impact of local politics on the principal-agent relationship between council and manager in municipal government. *Journal of Public Administration Research and Theory* 27:253–68.
- Damanpour, Fariborz. 1992. Organizational size and innovation. *Organization Studies* 13:375–402.
- Damanpour, Fariborz, and Marguerite Schneider. 2008. Characteristics of innovation and innovation adoption in public organizations: Assessing the role of managers. *Journal of Public Administration Research and Theory* 19:495–522.
- Druckman, James N., Martin J. Kifer, and Michael Parkin. 2009. The technological development of candidate websites. In *Politicking online: The transformation of election campaign communications*, ed. Costas Panagopoulos, 21–47. London, UK: Rutgers University Press.
- Federal Communications Commission. 2018. 2018 Broadband Deployment Report. [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-18-10A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-18-10A1.pdf) (accessed October 9, 2018).
- Feiock, Richard C., Moon-Gi Jeong, and Jaehoon Kim. 2003. Credible commitment and council-manager government: Implications for policy instrument choices. *Public Administration Review* 63:616–25.
- Gauld, Robin, Shaun Goldfinch, and Simon Horsburgh. 2010. Do they want it? Do they sue it? The “demand-side” of e-government in Australia and New Zealand. *Government Information Quarterly* 27:177–86.
- Godwin, Marcia L. 2014. Civic engagement and fiscal stress in American cities: Insights from the Great Recession. *State and Local Government Review* 46:249–59.
- Goode, Sigi, and Kenneth Stevens. 2000. An analysis of the business characteristics of adopters and non-adopters of World Wide Web technology. *Information Technology and Management* 1: 129–54.
- Hayes, Kathy, and Semoon Chang. 1990. The relative efficiency of city manager and mayor-council forms of government. *Southern Economic Journal* 57:167–77.
- Ho, Alfred Tat-Kei. 2002. Reinventing local governments and the e-government initiative. *Public Administration Review* 62:434–44.
- Holden, Stephen H., Donald F. Norris, and Patricia D. Fletcher. 2003. Electronic government at the local level: Progress to date and future issues. *Public Performance & Management Review* 26: 325–44.
- Hood, Christopher. 2006. Beyond exchanging first principles? Some closing comments. In *Transparency: The key to better governance?* eds. Christopher Hood, and David Heald, 211–26. Oxford, UK: Oxford University Press.
- Horrigan, John B., and Maeve Duggan. 2015. *Home broadband 2015*. Washington, DC: Pew Research Center. <http://www.pewinternet.org/2015/12/21/home-broadband-2015/> (accessed October 9, 2018).
- ICMA (International City/County Management Association). 2016. *Innovations and emerging practices in local government 2016 survey*. Washington, DC: International City/County Management Association. [https://icma.org/sites/default/files/309068\\_ICMA%20Innovation%20Survey%20Summary%20Report.pdf](https://icma.org/sites/default/files/309068_ICMA%20Innovation%20Survey%20Summary%20Report.pdf) (accessed January 11, 2018).
- Kaylor, Charles, Randy Deshazo, and David Van Eck. 2002. Gauging e-government: A report on implementing services among American cities. *Government Information Quarterly* 18:293–307.
- Krebs, Timothy B., and John P. Pelissero. 2010. Urban managers and public policy: Do institutional arrangements influence decisions to initiate policy? *Urban Affairs Review* 45:391–411.
- Kwon, Myungjung, Frances S. Berry, and Richard C. Feiock. 2009. Understanding the adoption and timing of economic development strategies in US cities using innovation and institutional analysis. *Journal of Public Administration Research and Theory* 19:967–88.
- Layne, Karen, and Jungwoo Lee. 2001. Developing fully functional e-government: A four stage model. *Government Information Quarterly* 18: 122–36.
- Lee, Guanhou, and Weidong Xia. 2006. Organizational size and IT innovation adoption: A meta-analysis. *Information & Management* 43:975–85.
- Li, M. H., and Mary K. Feeney. 2014. Adoption of electronic technologies in local US governments:

- Distinguishing between e-services and communication technologies. *The American Review of Public Administration* 44:75–91.
- Meijer, Albert. 2009. Understanding modern transparency. *International Review of Administrative Sciences* 75:255–69.
- Moon, M. Jae. 2002. The evolution of e-government among municipalities: Rhetoric or reality? *Public Administration Review* 62:424–33.
- Moon, M. Jae, and Peter DeLeon. 2001. Municipal reinvention: Managerial values and diffusion among municipalities. *Journal of Public Administration Research and Theory* 11:327–52.
- Moon, M. Jae, and Donald F. Norris. 2005. Does managerial orientation matter? The adoption of reinventing government and e-government at the municipal level. *Information Systems Journal* 15: 43–60.
- Morgan, David R., and Kenneth Kickham. 1999. Changing the form of county government: Effects on revenue and expenditure policy. *Public Administration Review* 59:315–24.
- Mossberger, Karen, Caroline Tolbert, and William W. Franko. 2013. *Digital cities: The Internet and the geography of opportunity*. Oxford, UK: Oxford University Press.
- Nam, Taewoo, and Theresa A. Pardo. 2011. Conceptualizing smart city with dimensions of technology, people, and institutions. In *Proceedings of the 12th Annual International Digital Government Research Conference: Digital government innovation in challenging times*, 282–291. ACM.
- National Telecommunications and Information Administration. 2014. *National broadband map: Analyze, summarize*. U.S. Department of Commerce. <http://www.broadbandmap.gov/summarize> (accessed February 1, 2015).
- Nelson, Kim L., and James H. Svara. 2012. Form of government still matters: Fostering innovation in US municipal governments. *The American Review of Public Administration* 42:257–81.
- Norris, Donald F., and Lori A. Demeter. 1999. Computing in American city governments. In *1999 Municipal yearbook*, 10–11. Washington, DC: International City/County Management Association. <https://catalog.hathitrust.org/Record/000534569> (accessed March 12, 2018).
- Norris, Donald F., and Christopher G. Reddick. 2013. Local e-government in the United States: Transformation or incremental change? *Public Administration Review* 73:165–75.
- O'Connor, Alice, Chris Tilly, and Lawrence D. Bobo. 2001. *Urban inequality: Evidence from four cities*. New York: Russell Sage Foundation.
- Perrin, Andrew, and Maeve Duggan. 2015. *Americans' Internet access: 2000–2015*. Washington, DC: Pew Research Center. <http://www.pewinternet.org/2015/06/26/americans-internet-access-2000-2015/> (accessed March 12, 2018).
- Rogers, Everett M. 2003. *Diffusion of innovations*, 5th ed. New York: Simon & Schuster.
- Teng, James, Varun Grover, and Wolfgang Guttler. 2002. Information technology innovations: General diffusion patterns and its relationships to innovation characteristics. *IEEE Transactions on Engineering Management* 49:13–27.
- Teodoro, Manuel P. 2011. *Bureaucratic ambition: Careers, motives, and the innovative administrator*. Baltimore, MD: JHU Press.
- Teodoro, Manuel P. 2013. Moving in, managing up: Executive job formation and political behavior. *Journal of Public Policy* 33:137–64.
- Tornatzky, Louis G., and Katherine J. Klein. 1982. Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management* 1:28–45.
- United Nations. 2016. *United Nations e-government survey 2016*. New York: United Nations, 79–105.
- U.S. Census Bureau. *Annual estimates of the resident population for incorporated places over 50,000*. U.S. Census Bureau. <http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF> (accessed March 12, 2018).
- U.S. Census Bureau. *American Fact Finder: Community facts*. U.S. Census Bureau. [http://factfinder2.census.gov/faces/nav/jsf/pages/community\\_facts.xhtml-none](http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml-none) (accessed March 12, 2018).
- U.S. Conference of Mayors. *2016 Smart cities survey*. <https://www.usmayors.org/wp-content/uploads/2017/02/2016SmartCitiesSurvey.pdf> (accessed March 12, 2018).
- Walker, Richard M. 2006. Innovation type and diffusion: An empirical analysis of local government. *Public Administration* 84:311–35.
- West, Jonathan P., and Evan M. Berman. 1997. Administrative creativity in local government. *Public Productivity & Management Review*, 446–58.

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