E-Gov Adoption in U.S. Local Governments: Bridging Public Management and Institutional Explanations in a Pooled Time Series Model ©

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Abstract

This study examines various predictors of e-gov application adoption for U.S. city governments. Hypotheses include a mix of institutional and traditional public IT management approaches. Example variables include form or government, direct democracy, existence of an IT unit, perceived adoption barriers, and urbanization. These are tested using the ICMA surveys (2000, 2002, 2004) using a pooled ordinal probit. To our knowledge, this is the first pooled time series test of e-gov adoption. Overall the results tend to be more supportive of public IT management perspectives. An exception is urbanization where a negative relationship is predicted by growth management research linked to institutionalism. Implications for public IT management and institutional theory approaches to e-gov adoption are discussed.

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There is a growing literature on e-gov adoption. One clear weakness is the prominence of cross-sectional studies or quasi-time series ones where the sample pool is not controlled (viz., Coursey and Norris, forthcoming). Furthermore, the literature is complicated by often competing institutional and public IT management perspectives that are rarely, if ever, concurrently considered.

This study addresses both concerns. We performed a pooled ordinal probit for the three ICMA local e-gov studies (2000,2002,2004) and provide numerous predictors and hypotheses with varying institutional and public IT management foundations.

Literature and Hypotheses

There are two distinct streams of e-gov literature (among others): traditional public information management and institutional. Traditional public management focuses more on organizational (including related politics), resources, and application features such as difficulty. Such studies tend to come from public administration researchers and authors more trained in traditional public IT research and not simply e-gov. Institutional theories instead tend to focus on more general political characteristics, such as government structure. Authors tend to be from political science and economics and not trained in public IT management and hence often not familiar with that literature. For example, Fountain's (2001) highly influential work has not one reference to any of the classic URBIS studies and has been criticized by traditional public IT management scholars as essentially reinventing Kramer's "reinforcement politics" theory (e.g., Norris, 2003).

In truth, both approaches are highly useful. Traditional public IT management theory addressing organizational level and technology issue are far more anchored in IT research, public or private. Institutional theory perspectives handle what traditional researchers would consider distal external factors better, such as government structure.

One interesting implication is that the two perspectives may provide not only varying explanations (cf. Fountain v. Kraemer) but also different predictions of e-gov adoption. Consider categorizing applications into three general areas: simpler to

implement/citizen client transactions, medium complexity business client transactions, and relatively difficult financial transactions with a mix of business and citizen clients (see Table 1 for examples). Traditional theory will tend to make predictions based on application complexity/resource needs and the immediate organizational politics of such applications. Institutional theory will center on structural and more general community political characteristics driving various adoptions. This mix presents a variety of sometime competing hypotheses and even in agreement, perhaps different explanations.

Below are a series of hypotheses, roughly outlined for this conference version of the research reflecting these differences for local governments:

Form of Government: Council Manager

Most of extant IT or e-government studies tend to rely on organizational characteristics to explain the adoption and impact of information technologies. This approach seems insufficient in analyzing local governments, where political institutions and local politics are important for decision making. Local government officials' incentives—regarding e-government adoption or in general—are shaped, at least in part, by the institutional environment in which they work. Several aspects of local government institutions are likely to be important such as the form of government and direct democracy provisions. The following hypotheses are more exploratory because very few prior e-gov studies have focused on this issue and there is not consensus about the nature of e-government decision making at the local level.

The form of government can be viewed as a constitutional contract that affects the incentive structure of various actors in the process of local decision making (Maser, 1998). Council-manager forms of government are associated with efficiency-gaining reforms that allow more services to be delivered per tax dollar (Ruhil, Schneider, Teske, & Ji, 1999). City managers are often "modernizers" who are critical to the decisions of local governments to experiment with scientific management tools (Poister & Streib, 1989; Berman & West, 1995) and they often function as public entrepreneurs (Feiock 2003). Since all three types of e-government services (financial, business, and citizens) have the potential to reduce the difficulty of local service coordination and improve long-term fiscal and managerial performance of local governments, they are more likely to be emphasized in council-manager governments.

$H_{1\text{-}1}$: Compared to other forms of governments, council-manager governments are more likely to adopt financial e-services.

$H_{1\text{-}2}$: Compared to other forms of governments, council-manager governments are more likely to adopt business e-services.

$H_{1\text{-}3}$: Compared to other forms of governments, council-manager governments are more likely to adopt citizen e-services.

The three types of the services, however, differ on some aspects, which may affect the plausibility of the hypotheses. Coursey and Norris (2007) observe that fewer local governments adopt online financial transactions, as opposed to non-financial transactions or non-transactional services, arguably because online financial transactions are more technically or managerially complex to develop. If this is the case, $H_{1\text{-}1}$ may be particularly true because professional managers participating in a competitive national labor market are more likely to pursue such financial e-transactions in order to gain reputation and move up to larger communities with larger staffs and budgets (Teske & Schneider, 1994). Conversely, online financial transactions, given their complexity, may require bigger investments and become a salient policy issue. If this is the case, $H_{1\text{-}1}$ may not be true because mayor-council governments are more likely to respond to salient political issues from which elected officials can claim credit for re-election (Lineberry and Fowler, 1967; Lubell, Feiock and Ramirez 2005).

Online business services are designed to help businesses to grow while online citizen services are geared toward citizens at large. According to the "insulation hypothesis" about reformed cities (Lubell, Feiock and Ramirez 2005), city managers are insulated from private demands and community pressures (Lineberry and Fowler, 1967; Marando and Thomas, 1977). As a result, city managers tend to emphasize county-wide or city-wide issues (Teske & Schneider, 1994; Ruhil, Schneider, Teske, & Ji, 1999). If this is the case, $H_{1\text{-}3}$ is more likely to be true than $H_{1\text{-}2.}$

Traditional public management theory would not so quickly agree. City managers would be viewed as a political resource and a "demand push" much like institutional theory. Such top political support is considered important especially for city managers because the view is they are somewhat more professional public administrators. City

managers may be seen as more permanent than mayors and so more likely to engender response. However, they simply do not, in and of themselves, generate the resources in staff and expertise to drive the hardest applications, especially as first adoptions. Institutional approaches, as demonstrated above, seem to presume development resources appear. Rarely do such political mandates to adopt new IT technologies come with the additional necessary resources for what are almost always overworked IT staff. Traditional public management theory, and even standard IT application development protocols, tends to favor a sequential development model where simpler less transactional applications are developed first. Hence, traditional theory may view city managers as more influential on simpler, less complex applications and not financial (at least not as powerful as institutional theory suggests).

H_2: Council-manager governments are more likely to adopt less complex applications (public management).

Direct Democracy

Another important local institutional factor is direct democracy provisions. There are three general types of direct democracy provisions in local governments: Initiative, referendum, and recall. The initiative allows citizens to place charter, ordinance, or home rule changes on the ballot by collecting a required number of signatures. The referendum allows citizens to place on the ballot any charter, ordinance, or home rule change that has been adopted by the local government before the change can be implemented. The recall provides opportunities for citizens to remove an elected official from office before the expiration of his/her term. Such provisions—regardless of the frequency with which they are used—affect government policies because the mere existence of them poses threats to elected officials and affects legislative responses (Gerber, 1996; Lupia & Matsusaka, 2004).

At least for fiscal and social policies over the past several decades, direct democracy provisions tend to have a conservative effect in terms of limiting government and reducing spending (Lupia & Matsusaka, 2004; Matsusaka, 2004). Since all three types of e-government services (financial, business, and citizens) have the potential to

reduce red tape, increase efficiency, and cut cost in the long run, they are likely to be associated with direct-democracy provisions (H_{2-1} to H_{2-3}). However, if we consider the fact that direct democracy intends to enhance the power of citizens at large, H_{2-3} is more likely to be true.

H_{3-1}: Direct democracy provisions are associated with higher levels of adoption of financial e-services.
H_{3-2}: Direct democracy provisions are associated with higher levels of adoption of business e-services.
H_{3-3}: Direct democracy provisions are associated with higher levels of adoption of citizen e-services.

Public management theory would tend to view direct democracy as a political influence on the organization for application development as a "demand push" as a user group. IT staff will want to adopt easier services first, partly from resources, but also based on typical IT development strategies to start small and work towards more complex, feature-rich applications. Staff are usually reserved from political requests if at all possible, due to being burned by demands for "fads" in IT, and carefully limit how they approach new technologies knowing they rarely get additional resources for new development and application support. Often the strategy is to build something simpler to see if it placates the demand. Non-transactional/citizen transactions are perfect candidates: simple, fast to implement, fairly easy to maintain. Direct democracy at the local level tends to be perceived as the expression of the general, or citizen will, at least in theoretical justification. Hence, again, citizen applications appear to gain the most from such provisions in terms of "demand push."

H_4: Direct democracy provisions are associated with higher levels of adoption of citizen transactions (public management).

Urbanization

Urban and suburban areas are expected to offer more e-government services because they have more resources and gain higher economies of scale from initiating such reforms. Previous public management based research has shown moderate evidence of a relationship between metropolitan status and e-government adoption (Moon and Norris 2005). Additionally, metropolitan areas are theoretically under increased pressure to make efficiency gains from the electorate (Moon and deLeon, 2001).

Institutional theory in growth management suggests a negative relationship. Local governments use managerial discretion to manage growth, in particular delay in building permit processing time has been used by local governments to manipulate the costs of development (Ramirez, 2007). The concept that local political institutions mediate between private actors and public officials to deliver growth management policies is based in the new institutionalism literature (Eggertsson, 1990; Lewis, 1996; Clingermayer and Feiock, 2001; Lubell et al., 2005; Jeong 2006). Local governments may be intentionally imposing barriers to online service provision to increase the costs of developments (Mayer & Somerville, 2000), slow market competition (Dowall 1984), or improve environmental conditions. A second possibility is that urban and suburban areas have more complex and constantly shifting building codes and procedures that do not integrate into an online environment. The cost of frequently updating information and risks associated with outdated codes may be greater than potential savings.

These competing explanations pose contrasting hypotheses:

H_5: Urbanization will be positively associated with e-gov adoption.

H_6: Urbanization will be negatively associated with e-gov adoption.

Strategic IT plan / IT management unit

Both of these are very traditional IT public management variables. Independent IT units are seen as critical to organize and deploy necessary application development and support resources, foster expertise to germinate projects, and centralize resources (Teo and Tan, 1998). These would be especially critical for hard financial applications and less

so for simpler business or citizen/non-transactional applications (see Table 1) given the need to commit resources (or expected resources especially if such plans are well connected to annual or capital IT budgets).

Strategic plans get a mixed review. Some see such plans as important in organizing directions (Moon and Norris, 2005) while others rarely more than either red tape products produced to satisfy political or legal requirements (especially in departments within state governments) or not reactionary enough to dynamic environments such as e-gov. Also, much of application development has been shown in cases studies , such as the State of Florida, to be highly driven by wants of political actors (whether orally expressed or sudden, unexpected legislative mandates), greatly overriding strategic plans (Coursey and Killingsworth, 2005). We tend to favor no relationship.

H_7: The existence of an independent IT unit will be positively related to e-gov adoption, but likely more powerful for financial applications.
H_8: The existence of a strategic plan for IT will not be related to e-gov adoption.

Changes from E-Gov

Success breeds more activity and so it is presumed the more a local government perceives e-gov has improved organizational management (e.g, reduce costs, etc.), the greater support and desire for future development. We see no real distinction between institutional and public management perspectives.

H_9: Perceived positive changes attributed to e-gov will be positively associated with adoption.

Barriers to E-Gov

The more barriers exist (such as a low development budget, lack of staff training), the harder it is to adopt e-gov services.

H_{10}: Perceived barriers to e-gov development are negatively associated with e-gov adoption.

Other Variables/Hypotheses

We also test several other more demographic variables which may be linked to e-gov development.

H_{11}: The percentage of the population over 65 will be negatively related to e-gov development.

H_{12}: The level of education in the community will be positively associated with e-gov development (Rogers, 2003).

H_{13}: The median local income will be positively associated with e-gov development (Rogers, 2003).

H_{14}: Population will be positively associated with e-gov development (Rogers, 2003).

Methods

Data Source and Development [1]

The data for this paper come from three nationwide surveys of local e-government that were conducted in 2000 and 2002 by the International City/County Management Association (ICMA) and Public Technology Incorporated (PTI) and in 2004 by ICMA. In order to provide for direct comparisons between the surveys, we used data from all responding counties but only from municipalities with populations greater than 10,000 from the 2002 and 2004 surveys (as that was a limitation of the 2000 sample frame). The ICMA samples are derived from the relative population distributions of key demographic variables, or stratified, on such variables as form of government and region. Each returned sample has been quite representative of the known population but otherwise, the ICMA data has various limitations, mostly related to question wording changes, discussed elsewhere (i.e., Coursey and Norris, forthcoming).

[1] Much of this section is verbatim from Coursey and Norris (forthcoming) and will be altered later for journal submission.

The three years of ICMA data were merged using the ICMA municipal identifier (imisid). After merging, data was reduced to cities responding to all three surveys. This resulted in a sample size of 933, approximately 50% of the response for each year. Diagnostics for potential attrition-related response are being conducted.

Additionally, two other data sources were merged to add various institutional predictors. First, the 2001 ICMA form of government (FOG) survey was merged using the ICMA individual identifier (imisid). The merger of the two files did not result in any additional missing values. Second, data from the 2000 U.S. Census was merged using the federal information processing standards codes (fips codes). The fips codes are unique identifiers set by National Institute of Standards and Technology (NIST) for each governmental entity in the U.S. Unfortunately, the fips codes did not match for 232 of the units and the missing observations were dropped. We are currently investigating this as it strongly suggests ICMA data entry errors. We will be matching these to add the missing 232 to the study. For now, this resulted in a final sample size of 701 cities for the three periods.

Variables

Dependent

Table 1 lists all the study variable operationalizations. The dependent variables are measured using summative scales of the indicated existence of online services and treated as ordinal. The services are divided into three categories: mixed citizen/business (such as tax, fine, utility payments) which are also financial transactions, business (permit applications, business licenses and renewals), and citizen (recreational program registration, personal property registration, requests for government information/records, requests for services (like pothole repair), and voter registration). Categorization is by the dominant user or perceived market demand for such services. Some applications categorized as citizen or business, such as permit applications and requests for government records, may be used by both groups as well. However, they are best

categorized by the likely dominant user group (permit applications are overwhelmingly businesses). Table 1 provides the list of services appearing on all surveys.

Other studies also use the services question as a dependent variables (Moon and Norris 2005; Reddick, 2004) with different operationalizations. Variables simply measuring the number of services are contested because they do not provide information on the diffusion or quality of online services (Kunstelj and Vintar, 2004). However, there are conceptual differences between quality, adoption, and diffusion. Hence, the measurement does not tap how various influences affect diffusion. Rather, they tap adoption as an organizational innovation. For example, there is no distinction between a local government with one permit application that is barely used versus another government with numerous, high-volume ones. It is very questionable to presume to same factors account for (or at the same level or pattern of influence) both diffusion and adoption. For example, a strong IT department may not be that critical to an initial, simple permit application, but it is to significant diffusion due to application development and maintenance needs. It is critical that authors distinguish diffusion and adoption in their theory, data interpretations, and inferences.

Independent Variables – Institutional

The first institutional independent variable is type of government. This is a dummy variable where council-manager is coded one and all other types of government, overwhelmingly mayoral systems, are coded zero. A second institutional variable measures the number of direct democracy provisions in the locality. The scale is developed from the 2001 ICMA form of government survey by summing the existence of citizen initiatives, popular referendums, and recall.

Independent Variables - Managerial

Managerial adoption obstacles are measured using a lag of a summated scale of possible barriers (not change in intensity) to e-government in the ICMA. An important caveat associated with the barriers to e-government variable is that the poor measurement

of this variable is likely to cause insignificance, as it has in previous studies (Coursey and Norris, 2006; Moon and Norris, 2005). The survey question simply asked respondents to indicate if these issues were hindrances to local provision. A more appropriate question would indicate the magnitude of the problem. However, if this variable is found insignificant, it is possibly attributable to specification and/or measurement error and not theoretical miscalculations.

The effect of e-government on local government management is measured similarly to the IT barriers variable. A scale is developed by summing the categories in Table 1. The difference is taken as an indicator of perceived organizational improvement caused by e-government. The "increases demand on staff" category was recorded as a negative one instead of a positive one unlike all the other choices because it is the only choice that measures a negative impact for e-government.

Two additional managerial independent variables are separate IT units and city e-gov strategic plans. The variable for separate IT departments was measured with each survey and can vary over time, but it only changed in fewer than three percent of the cities. Only the 2000 survey asked if cities have strategic plans for e-government and the value is carried forward for years 2002 and 2004. This is reasonable given the time horizon and effect of such plans should be about four years. Both variables are binary coded.

Independent Variables – Demographic

Population is measured by an ordinal indicator using ICMA categories.[2] This item is reverse coded. Education is measured as the proportion of citizens with a 4-year college education. The median income is included as a continuous variable after a natural logarithmic transformation to adjust for income's excessive skewness. The percentage of the population over 65 is included for each locality. Dummy variables are also included

[2] 0=Over 1,000,000; 1= 500,000-1,000,000; 2= 250,000-499,999; 3=100,000-249,999; 4=50,000-99,999' 5=25,000-49,999; 6= 10,000-24,999.

for urban and suburban, leaving rural as the comparison category. The urban, suburban and rural classifications are all provided by the OMB and are included in the ICMA data.

Independent Variables – Model Specification

Two variables are included for model specification. The survey year is included as a nuisance parameter in accordance with common time series practices (Wooldridge, 2002). The pooled model automatically includes a linear time trend and the additional parameter is usually indicative of unobserved effects or non-linearity if significant.

The second model specific parameter is a lagged dependent variable. The lagged dependent variable was added to the model because diagnostics indicated sequential endogeneity. There are two main causes for inclusion of a lagged term. The first is historical effects, such as path dependence (Arthur, 1990), driving future decisions. Second, lagged dependent variables protect against sequential endogeneity, which frequently results from an unobserved covariate being correlated with the regression model errors. A palpable unobserved effect in this study is local political climate which can be viewed as an institutional variable. Online service delivery has become associated with the efficiency ideas of new public management (Osborne and Gaebler, 1992) and conservative political culture. Unfortunately, no decent measures of city level political climate or ideology are available on a national scale and it is very possible that the lagged variable is representing this political effect. The inclusion of the lagged dependent variable drops an entire year's worth of observations, but the information contained in the 2000 survey is still included in the lagged dependent and differenced independent variables. The 2000 data is used as it benchmarks the model**.**

Analysis

Model results are provided in Table 2. The data was analyzed using a pooled ordinal probit (POP) model (Agresti 2002; Miller et al., 1993; Wooldridge, 2002). A pooled model is required because any cross-sectional model would underestimate standard errors in the presence of repeated measures. An ordinal model is necessary

because the linear regression assumptions of normality and homogeneity are violated when the dependent variables are both ordinal in nature, ranging from 0-3 and 0-7 in this case. The choice of a probit over a logit link function is rather arbitrary in this model since both produce similar results. The decision to employ probit is based on a marginally higher likelihood value.

The POP type used in this paper is a generalized cumulative model. The proportional odds and partial proportional odds models are frequently used special cases of the generalized cumulative model which have better behaved statistical properties. Both special cases require the assumption of parallel lines, meaning that the slopes are the same in-between each set of ordinal levels and across time, which is nearly impossible to uphold over multiple years with numerous independent variables. The generalized cumulative model has less statistical power than these special cases and can result in probabilities that do not sum directly to one, but it remains the most viable and suitable model choice. A more detailed discussion of the different ordinal model choices can be found in Agresti (2002).

The POP model is estimated using generalized estimation equations (GEE) (Liang and Zeger, 1986). GEE models are termed marginal models or population averaged models. Marginal models focus on the overall average response for observations with the same independent variable values. The most frequently used alternatives to GEE are conditional models performed by random or fixed effects. Conditional models are based on modeling individual units instead of population means. The focus of this research is the general trend of e-government service adoption across the entire U.S., and therefore a marginal model is more appropriate. However, the statistical realities that random effects estimation requires additional assumptions unlikely to be upheld in this data set and that

GEE generally handles multicollinearity better than random effects estimation were considered.[3]

Model verification techniques for GEE models are not standardized like OLS and there is no one "right" assessment method. The time series structure was checked by adding leading and lagging variables to the model, similar to pooled regression analysis (Wooldridge, 2002). A lagged dependent variable was found to be significant, indicating sequential endogeneity, and was therefore kept in the final model. The residuals were checked using a simulation procedure developed specifically for cumulative models (Lin et al., 2002). No major specification issues were identified and no observations were deleted.

Results

Table 2 provides the results for the three models. In all three models, population, e-gov effect on management, and the lagged adoption variables are highly significant ($p<.01$). The results suggest adoptions are more likely for all three types of transactions for larger local areas population increases. The lagged adoption variable indicates unobserved variables covarying with model errors and/or historical effects. Historical effects are obvious in that if a government had a transaction type in 2002, they almost certainly still have it in 2004. As noted earlier, it is also reasonable to suggest a possible contributor is local political climate as both an unobserved covariate and historical effect. Lastly, a positive change from the previous period in the level e-gov positively affected management relates to more adoption. Perceived gains encourage adoption.

The institutional (council manager and direct democracy) variables only support the theorized pattern to one model: significant or close to significant respectively for the citizen transaction model and not significant in other models. These institutional factors

[3] Further detail concerning model estimation choice is beyond this paper, but more information is available on the choice between marginal and conditional models (Agresti 2002; Diggle, Liang, and Zeger 1994), the availability and accessibility of GEE models in common statistical packages (Horton and Lipsitz 1999), and examples of GEE model usage in political science (Zorn 2001).

may enable the organizational and political climate for simpler e-gov but they are not maintaining influences towards adoption of more advanced, technical applications constituting the business and especially the mixed/financial transactions requiring monetary processing among other data link complexities. All the citizen applications, sans voter registration, are typically simple applications that at most, require database record creation and email with no links into other databases.

These results are perhaps more indicative of expectations from traditional public management views than institutional ones. City managers may have professional views of public service creating a positive climate for adoption, but their political interest in such endeavors is likely lower than an elected mayor. The assigned resources suggested by institutional theory are not within the experience of most, traditional IT new application development. Government IT units are rarely given resources for new, politically assigned tasks and typically they cope through strategies involving careful, limited, and less expensive approaches to new technologies. Hence, the citizen transactions which are mostly far simpler, less transactional, are more likely to be adopted. The results support this view. Additionally, traditional public management literature approaches (e.g., Coursey and Killingsworth, 2004) has noted that e-gov innovation is heavily influenced by elected officials for political gain. Hence, perhaps the effects neutralize each other.

The direct democracy variable is particularly intriguing as it is borderline insignificant (p=.0564). It is perfectly logical that governments with stronger direct democracy features will be more likely to adopt citizen transactions but have less influence on business application. Additionally, the same resource limitation explanation of council-manager influence applies. It should be noted the citizen model has significantly less statistical power than the other two because it must measure five intercepts compared to three and two for the others.

The urbanization variables are quite interesting for their significance in the business model and insignificance in the other two. Both urban and suburban areas are

less likely to adopt than rural areas. This may seem counterintuitive but it fits local government development research based in institutionalism. Local governments use withholding or complexity of service for activity associated with the business transactions, such as permit applications and business licenses, as a strategy to limit unwanted growth. For rural governments, there are several reasons favoring adoption including, perhaps, attracting businesses and growth. Additionally, rural areas likely face greater resource strains in service delivery exacerbated by a dispersed client business community. Often in the case of permit applications for housing, for example, the applicants are likely to be outside the local area. Hence, the rural governments may see a greater need to adopt e-gov business transactions. Necessity breeds innovation. However, it should be carefully noted this applies to adoption, not the level of diffusion of such transactions.

The existence of a strategic e-gov plan is not significant in any model though close in the citizen one (p=.099). This is as expected for two reasons. First, the existence of a strategic plan in of itself means little: it is whether a plan is actually supported with resources and implemented. Too often, such plans are developed simply to meet legal or managerial mandates and have little real application. Second, the short time horizon in this study (four years) provides relatively little time for the usually longer scope of such documents to be influential. Lastly, the dynamic technological environment in e-gov makes strategic planning, arguably, less germane.

The other variables (education, age over 65, income, strategic plan, change in barriers) have mixed results. Barriers is insignificant in all models though marginally insignificant in the mixed/financial one (p=.06). The barriers variable only notes the existence, not the intensity, these perceived barriers pose to e-gov development. It could be if measured more adequately that stronger, significant relationships would be found. As is, the results are stronger for the more challenging applications. This is not terribly

surprising either as many of the barriers, such as privacy and security, would be more critical to these applications involving monetary transactions.

Education is highly significant in the mixed/financial model ($p<.01$), insignificant for business transactions, and marginally insignificant for citizen applications ($p=.09$). Education may be more important to the more complex applications as they involve a level of trust in the technology (e.g., secure financial transactions, using your credit card) that tends to be associated with greater education and likely IT knowledge. Education is clearly insignificant for business applications as the level of general populace education, as expected, has far less to do with the education of a business community or its representatives conducting online transactions.

Age over 65 holds a similar expected pattern to education. A younger populace may be far more familiar with e-gov technology and expect such financial services as online tax and utility payments. Age over 65 has, like education, not as much to do with business clients.

Discussion

This paper sought to examine somewhat competing explanations of local government e-gov adoption: institutional versus traditional public management. For the clearly institutional variables (form of government and citizen democracy provisions), the public management expectations appear better fits. This is likely due to the inability of institutional approaches to show the actual resources they expect to come from the assumed demand-driven relationships. Institutional theory fails here at the more resource extensive applications. Perhaps a far better test of institutional theory would be a path model with development resources as an interceding variable. The finding that council manager systems are more important in certain types of services may also help explain the conflicting results concerning this variable in previous studies. The majority of research has shown that manager form of government is associated with higher levels of e-government (Brudney and Selden, 1995; Moon, 2002), while other studies have found

no impact (Moon and Norris, 2005).

The finding that traditional public and bureaucratic management explanations perform better in predicting government outputs than institutional/political control one is not alone. In their study of outputs from Texas schools, Meier and O'Toole (2006) found that traditional public administration perspectives on bureaucratic control (which mirror public IT management) are far more powerful explanations than political factors resting on much of the same economic theory and logic as institutional explanations. They urgently recommend political control theorists consider and include bureaucratic control measures as alternative explanations. Here, the results are similar: side by side, public management theory, largely based on bureaucratic control in relation to the institutional variables such as form of government, works better.

From a strictly institutional perspective, $H_{1\text{-}1}$ and $H_{1\text{-}2}$ are not supported even though financial e-services and business transactions are likely to improve efficiency as well. The traditional argument on council-manager cities consists of two components: such cities are more likely to (1) emphasize efficiency and (2) focus on city-wide issues and citizen at large. Our results may suggest that the two components should be considered together. Although financial e-services and business transactions can improve efficiency, they are not necessarily benefiting citizens at large (at least not directly) and, therefore, not associated with the form of government. The lack of empirical support for $H_{1\text{-}1}$ also indicates that online financial transactions may not be perceived by city managers as management innovations that can potentially enhance managers' reputation and marketability.

$H_{2\text{-}1}$ and $H_{2\text{-}2}$ are not supported, although financial e-services and business transactions are initiatives that can reduce government spending in the long run. Observations about the conservative effect of direct democracy provisions, which are made in the area of fiscal and social policies (Lupia and Matsusaka, 2004; Matsusaka, 2004), may not be directly applicable to e-government. Another explanation is that

citizen democracy provisions increase the power of citizen at large and it does not increase the likelihood of adopting initiatives oriented to narrower business interests.

Urbanization was negatively association with adoption in only the business transaction model. While this may seem a bit counterintuitive, it is perfectly logical in relation to a substantial literature in most institutional and economic-theory approaches to local growth management**.** More than perhaps the other independent variable results, the urbanization findings strongly indicate the importance of considering the presumed clients of applications in adoption studies and not just application complexity.

Strategic IT plans are only significant in the citizen transaction model, and then finds a marginally insignificant (p=.099) negative relationship. This suggests such plans are associated with less adoption. This seems counterintuitive but one possibility is that such plans written in 2000 did not adequately consider possible e-gov applications and if they are strictly followed, they would suppress citizen transactions. Though the evidence for a negative relationship is weak, the finding suggests further consideration of the role of strategic plans.

Other variables, such as local area population, median income, IT units which relate directly or indirectly to resources support public management views that adoption is difficult no matter what the political landscape without resources. In the cases where these variables are insignificant, they are on the simpler applications. This is perfectly logical as the mixed/financial transactions are more resource intensive to develop.

Education and age over 65 support views that factors relating to a populace's IT knowledge and familiarity will support adoption. Adoption is also found to be positively associated with perceived positive organizational changes attributed to e-gov.

Caveats (note: this section in development)

Like all studies, there are limitations. The barrier variable is imperfect as simply noting existence and not intensity. The adoption variable could also use a version more suitable to diffusion or stressing application quality and actual use (though in reality

those are separate constructs). The lost data due to mismatched fips codes is troubling, though we should be able to address this as we further this study. The ICMA data itself has limitations noted elsewhere (Coursey and Norris, forthcoming).

Conclusions

This study sought to examine a variety of predictors of e-gov adoption in local government. Uniquely, a pooled time series approach was used for a cohort of city governments. Second, the variables allowed testing of a mix of institutional and public IT management approaches to adoption predictions. Overall, the results tend to favor public management explanations over institutional ones. The exception is urbanization with its negative relationship as predicted by growth management research based in institutionalism. Many of the relationships, especially as they vary in significance between the most and least complex transaction types, suggest the importance of development resources as expected from traditional public management. While institutional theory tends to presume resources will be committed due to political demand. Public IT management theory, more focused on proximate organizational factors, tends to eye such resources as suspect at best. The more complex applications require greater resources and the relationship patterns support this view. Institutional factors tend to be more influential on less complex citizen applications.

Do the results mean institutional theory is simply not useful? Hardly. As we acknowledge, our discussions on the impact of local institutions on e-government adoption is exploratory in nature. The adoption story/dynamics vary across policy areas and e-government is a unique area of policy. However, so far we do not have a clear understanding of the e-government decision process in local governments. Even basic descriptive work is lacking the literature. It is not clear how elected officials, managers, and employees view different areas/dimensions of e-government, nor is it clear who is making what decisions regarding e-government. Our results are not conclusive, but raise

questions for future studies. It is important that institutional theorist in IT develop better models for demonstrating resource connections to their demand functions.

That is not to say public IT management theorists can gloat. For too long, the government literature has tended to focus on more internal organizational factors. Institutional theory grants a fresh perspective bringing a desirable set of new predictors and conceptualizations. The urbanization results are a perfect example -- an area where there is little or no attention in the public IT management literature. Both perspectives are useful.

Finally, this study demonstrates the importance of carefully denoting adoption types. Instead of simply summing application forms, we carefully considered their latent characteristics and connected those to theory. The varied results across predictors highlights the importance of distinguishing applications in future research.

Table 1

Variable Definitions

Scaled Variables

Mixed/Financial Transactions	Business Transactions	Citizen Transactions
Tax payments Utility payments Fee and fine payments	Permit applications Business licenses and renewals	Government record requests Recreational program registration Service requests Voter registration Property registration
Direct Democracy	**Barriers to E-Government**	**Changes from E-Government**
Citizen initiatives Popular referendums Recall	Lack of technology / web staff Lack of technology / web expertise Lack of information on e-gov applications Lack of support from elected officials Need to upgrade PCs, networks Privacy issues Security issues Lack of financial resources	Reduced number of staff Increased non-tax revenues Reduced administrative costs Reduced time demands on staff Increased demands on staff Re-engineered business processes Business process more efficient

Ordinal/Dummy Variables

Population	City Manager	IT Department
0 = Over 1,000,000 1 = 500,000 - 1,000,000 2 = 250,000 - 499,999 3 = 100,000 - 249,999 4 = 50,000 - 99,999 5 = 25,000 - 49,999 6 = 10,000 - 24,999 ***Notice that the direction is reversed***	0= Other 1= City manager	0= No 1= Yes
Stategic Plan	**Urban**	**Suburban**
0= No 1= Yes	0= Other 1= Urban Area	0= Other 1= Suburban Area

Continuous Variables

year	The survey year (2002 or 2004)
education	Percentage of population with a 4 year degree
age over 65	Proportion of population over 65 years old
log income	Natural log of median income
lag(adopt)	The previous survey years value for the dependent variable

Table 2
Model Results

	Mixed/Financial Transactions				Business Transactions				Citizen Transactions			
	Estimate	**Std. Error**	**Z**	**p**	**Estimate**	**Std. Error**	**Z**	**p**	**Estimate**	**Std. Error**	**Z**	**p**
year	0.3905	0.0746	5.23	<.0001	-0.0246	0.0622	-0.4	0.6923	0.0227	0.0428	0.53	0.5956
population	-0.3093	0.0429	-7.20	<.0001	-0.2014	0.045	-4.48	<.0001	-0.1454	0.0339	-4.29	<.0001
city manager	0.1613	0.1154	1.40	0.1621	0.1083	0.1187	0.91	0.3616	0.1717	0.0806	2.13	0.0331
education	3.2149	1.1136	2.89	0.0039	0.2927	1.0034	0.29	0.7705	1.3446	0.8074	1.67	0.0958
direct democracy	-0.0367	0.0322	-1.14	0.2547	0.0114	0.0327	0.35	0.7282	0.0455	0.0238	1.91	0.0561
age over 65	-1.633	0.709	-2.30	0.0213	-0.1924	0.6003	-0.32	0.7486	-0.4768	0.4614	-1.03	0.3014
ln(income)	-0.6248	0.1983	-3.15	0.0016	0.3168	0.1731	1.83	0.0672	-0.0397	0.1414	-0.28	0.779
strategic plan	-0.092	0.1292	-0.71	0.4762	-0.1047	0.1205	-0.87	0.3848	-0.1474	0.0894	-1.65	0.0994
IT department	0.2938	0.1634	1.80	0.0722	0.0412	0.1341	0.31	0.7588	0.0481	0.0929	0.52	0.6044
lagged IT barriers	-0.0421	0.0227	-1.86	0.0632	-0.0055	0.0227	-0.24	0.8082	-0.0008	0.0155	-0.05	0.9609
IT effect on mgt	0.0699	0.0246	2.84	0.0044	0.0843	0.0248	3.4	0.0007	0.0495	0.0188	2.63	0.0087
urban	0.1642	0.1625	1.01	0.3122	-0.3083	0.1563	-1.97	0.0486	-0.0843	0.1128	-0.75	0.4548
suburb	0.2046	0.1429	1.43	0.1524	-0.3445	0.1371	-2.51	0.012	0.0807	0.0963	0.84	0.4019
lag(adopt)	0.0896	0.029	3.09	0.0020	0.1787	0.0286	6.24	<.0001	0.2242	0.0244	9.18	<.0001
Log Likelihood	-748.758				-676.722				-1723.397			
number of cities	701											
total observations	2103											

**GEE estimation does not permit R-squared type measures

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