Urban Electronic Government - Innovation, Adoption, and Metropolitan Characteristics

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Abstract

This paper defines e-government, outlines non-market failure which is believed to be a factor in e-government provision, highlights some previous applicable literature on government innovation, and offers findings from a regression model created using factors offered by previous literature and recent data from sixty-seven of the largest US metropolitan areas.

Keywords: Urban Governance, Urban Characteristics, Internet, Web Sites, E-government, and Innovation Factors.

Americans live in times of great social and technological change. United States' cities continue to evolve with ever-growing suburbs; suburbs which are now the location of the majority of American jobs and residences. At the same time, many US cities are choosing to expand their limits, incorporating new geographically, socially, and culturally unique areas (Rusk, 16). Non-coincidentally, these changes come at a time when city governments have begun to place much more emphasis on the use of technologies (Bingham, 1). City governments across the country have begun to invest billions of dollars in electronic government (e-government) to offer information, communications, and services, in the form of web sites and portals, to citizens twenty-four hours a day in their homes, offices, or anywhere else there is a computer.

To date there have been many application and project evaluation studies carried out on e-government initiatives, mostly centered on the federal and state levels. Beyond this, given the cutting edge nature of e-government and its technologies, not much in-depth research has been carried out addressing the reasons (the characteristics of a given metropolis) specific local governments choose to adopt certain levels of e-government, while others offer different levels. This is especially the case for city level government information technology initiatives. This paper will define e-government, outline non-market failure which is believed to be a factor in e-government provision, highlight some previous applicable literature on government innovation, and offer findings from a regression model created using factors offered by previous literature and recent data from sixty-seven of the largest US metropolitan areas.

1. What is Electronic Government?

As defined by Kuno Schedler and Maria Christina Scharf, "Electronic Government is a form of organization that integrates the interactions and the interrelations between government and citizens, companies, customers, and public institutions through the application of modern information and communication technologies." The forms most often used by urban governments today are web sites and web portals. In offering e-government in the form of web sites, a city will usually have a main page (and sub-pages) for the site with links to unique and individual page sets associated with specific city offices and agencies. A slight alternative to this approach is the portal technique. A portal is noted by a main page, usually organized around the type of user (which is initially selected by the user) and has links to a variety of groups of services or different city offices and agencies all offered with the same stylistic, usable, and organizational design. For the purposes of this paper, the phrase web site(s) refers to both web sites and web portals, as discussed above.

2. Economic Justification for City E-Government Initiatives

When one looks at the application of e-government technologies, in the form of sites, one specific non-market / government failure (essentially the same as a market failure, Whittman, 1395) arises as a reason for their use. Failures attributable to **Informational Asymmetry** appear to be factors in why urban governments adopt e-government projects.

Informational Asymmetry is defined as, "a situation in which the parties on opposite sides of a transaction have differing amounts of information relevant to the transaction (The World Bank Group, 2001)." An individual citizen's knowledge of city government structure and its offering of services will often vary due to his or her education level, occupation, interest in government, etc. Often, when a citizen realizes he or she needs a service, they do not know which level of government offers the service, which entity is responsible for providing the services, and/or who the proper personnel are to contact. Also, in regards to businesses, the ability of a company to maintain an accurate knowledge base of commercial laws, proposed commercial legislation, and current business developments varies depending on the size and resources of that business. This same variation in knowledge exists with the assortment of non-profit organizations as well (Franzel, 66).

To combat such non-market failures, city governments can and have begun to use e-government techniques like web sites. With government web site availability, citizens, businesses, and non-profits are provided single-point access to the specific city's information and electronic services pertaining to education, government structure, financial issues, laws, and many other topics (Wylie, 2000). This information includes much governmental information, but is not limited to just this one sector. Many city portals include information on and for private firms and non-profits. For instance, on the city of Tampa's portal, tampagov.net, the "Doing Business" section has information on economic development and trade, public records, area business developments, etc. The ease of location of the governmental and

non-governmental information and services eliminates barriers that may otherwise impede citizens, private firms, and non-profits (Keening Group, 2003).

E-government in the form of sites appears to be an effective way to address the non-market failure of Informational Asymmetry. With increased knowledge and access to services for all users, the true levels of consumer demand and firm / government supply can be more closely achieved, given inherent costs of access to the Internet by consumers and costs of site production by governments (Chan, 4). This establishes an environment where, given these more accurate supply and demand levels, more efficient levels of transactions and mutually welfare-enhancing trades can be made. And, as one might assume, such an environment of increased efficiency becomes even more so given the fact that the level of government carrying out the project is the city level, with its understanding of issues, needs, and wants of the local consumer and supplier alike.

As of February 2002, more than 143 million Americans, or fifty-four percent of the total population of the United States, have used the Internet. This number continues to increase at a rate of approximately two million users per month (NTIA, 2002). Computers have become well-used and available appliances in schools, libraries, businesses, government establishments, and in millions of homes. Government could invest in more traditional programs like phone books, television ad campaigns, and public service announcements to educate the public and provide services, but it would not be taking advantage of the communication and service provision potential of modern technologies that many Americans use on a daily basis.

3. Applicable Literature on Government Innovation

There have been many works written on specific inducements of general governmental innovation. In order to identify environmental, organizational, and social characteristics for the next section of this paper, that looks for characteristics which may lead to higher or lower levels of urban e-government adoption, three specific pieces have been highlighted. They are Richard D. Bingham's, "Innovation, Bureaucracy, and Public Policy: A Study of Innovation Adoption, by Local Government," Alfred Tat-Kei Ho's, "Reinventing Local Governments and the E-Government Initiative," and "Public Management – Theories and Innovations," by Peter John and Ruth Webster.

In "Innovation, Bureaucracy, and Public Policy: A Study of Innovation Adoption, by Local Government," Bingham, while examining innovations by housing authorities, school districts, public libraries, and municipal governments, offers four categories of factors which lead organizations toward policy of advancement. Those applicable to this paper are: (1) *community environment* – demographic and cultural values, (2) *policy demand* – the communities demand or need for a service/item, (3) *organizational environment* – relations with private sector and other non-governmental units and resources available from non-governmental sources, (4) *characteristics of the organization* – structure, leadership, and ideals.

Alfred Tat-Kei Ho in his, "Reinventing Local Governments and the E-Government Initiative," outlines several factors which lead to the incorporation of information technologies by cities, with an emphasis on network building, external collaboration, and customer service. In this article, (1) *diversity* of population and governmental organization, (2) *experience* of population with specific technology, (3) *access* to technology by population, and (4) *wealth / income* level of population, are all denoted as reasons for urban government adoption of technology, specifically, web-based information technology.

Peter John and Ruth Webster, in their examination of bureaucratic organization, change, and transformation, identify three factors which pressure urban initiative. These factors are: (1) *environmental factors* – community needs and problems, (2) *external agencies / actors* – persons or groups outside of local government who might ask for or legally require policy supporting innovation, and (3) *management practices* – leadership wants and values.

Each of these three studies was used in selecting the specific characteristics of metropolitan areas used in the following section on trends in urban e-government adoption.

4. Urban Characteristics and E-Government – Measurement and Estimation

In an attempt to better understand urban e-government innovation and factors which contribute to its application, regression was used to examine the impact of specific urban characteristics, which were selected using applicable literature (cited earlier in this paper), on the electronic government rating of sixty seven (N=67) of the largest metropolitan areas in the United States.

Variables:

The *e-government rating* (dependent variable) used in this paper was from the 2002 Urban E-Government study conducted by Darrell M. West and the Center for Public Policy – Brown University (West, 2002). The ratings of the study were compiled using evaluation techniques on information availability, service delivery, e-government services, human support, and public access of city web sites. The study's ratings were offered on the top seventy metropolitan areas' (2000 US Census Bureau) sites and assigned ordinal values between 1 and 100.

The independent variables tested were the *structure* of the urban government, the *party* of the mayor, *internet connectivity* level of the city, *professionalism* of the city, *racial breakdown* of the city, and *median age* of the city.

- The *structure* of the urban government was gathered from the Rand publication, "Meeting the Challenge of Charter Reform." In the publication, the largest 100 US cities are divided into three categories (McCarthy, 1998):
    - Mayor-Council System – Has a legislative body that is elected either at-large, or by ward / district, or by some combination of the two. This system is unique for two reasons, the mayor is elected separately and the official designation of the Office of Mayor is the formal head of the city government. (ICMA, 2003).
    - Council-Manager System – Has a leader (usually a mayor) elected by popular vote

who acts as a member of the city council and ceremonial figure. They are responsible for policymaking, while the management of the organization is under the direction of a city manager (who is appointed by the city council). (ICMA, 2003).

- Commission System – Usually holds non-partisan, at-large elections, includes a board of commissioners, who act as the legislative body. Individually, each commissioner serves as the head of one or more departments. (ICMA, 2003).

Note: Because Mayor-council system is most popular form and commission form is almost never used, a dummy variable was used for the *structure variable* with Mayor-council as the reference and council-manager / commission forms combined to form the alternative.

- The *party* of mayor from the sixty-seven cities used was mostly gathered from The United States Conference of Mayors - Mayoral Election Results Database (USCM, 2003).

  Note: A dummy variable was used for the *party variable*, with Democrat as the reference and Republican/Other as the alternative. This was done because it was assumed due to associated partisan ideology; a democrat mayor would be more likely to push for funding to be used for government IT initiatives. (The opposite could also be posited as Republicans are generally considered to be pro-business and for any associated techniques or innovation, but one party had to be selected for reference).

- The *Internet connectivity* / *wired city* was identified as a city being listed in the Nielsen / NetRatings 2001 Internet Audience Rating List (latest version when this paper was being written). The rating system offers the top 25 US cities with the highest percentages of households with an internet connection (range from 69.7% - 53.1%) (Nielsen, 2001).

  Note: A dummy variable was used for *internet connectivity / wired city,* with a city listed on the Nielsen / NetRatings List as the reference and not listed as the alternative.

- The *professionalism* / *percent white collar* of the city was denoted by the total percentage of those who work in the management, professional, sales, and service sectors of each city. Percentages were obtained from the Census 2000 Supplementary Survey, which reflects data from the entire population.

- The *racial breakdown* of the city was obtained from the percentages of Whites, African-Americans, and Hispanics from the Census 2000 Supplementary Survey, which reflects data from the entire population.

- The *median age* of the city was obtained from the Census 2000 Supplementary Survey, which reflects data from the entire population.

Findings:

Table 1 highlights the descriptive statistics for the e-government rating, city structure, percent white collar, wired city, party of mayor, percent White, percent African-American, percent Hispanic, and median age variables. While Table 2 shows the results of the multi-variate regression model. Three specific variables were found to be significant, they were: City Structure, Percent White Collar, and Wired City.

From Table 1, it is observed that roughly 50% of the 67 cities use a mayor – council governance system, the vast majority of the rest use the council – manager system, and only one uses a commission system. Before carrying out the regression there were no prior expectations as to the effect the structure of urban government has on e-government rating. The model, as displayed in Table 2 shows that, holding all other variables constant in the model, if a city has a mayor - council system, the e-government rating goes up by 4.44 points ($p \leq 0.10$). This relationship and its underlying reasons would be interesting to study in future projects, as it would add a new and unique aspect to the existing governance-structure literature.

Prior to running the regression, it was predicted that the professionalism / percent white collar workers of a city would affect the e-government rating positively, given that white collar jobs and their associated education typically involve more use of technology and understanding of general government services. This appeared to be a correct prediction. The range of white-collar percentages in the cities is 27% to 49% (Table 1). The coefficient in the model, Table 2, for percent white collar is 1.06. This means that, holding all other variables constant in the model, for every 1% increase in while collar persons in a city, the e-government rating will go up by 1.06 points ($p \leq .002$ 1-tail).

The third variable found to be significant was wired city. As was the case with the previous variable, before running the regression, it was predicted that the fact that a city is more wired than others would cause an increase in e-government rating; more users of the technology, more demand / need for its adaptation to government. The coefficient for wired city is 5.39. Holding all other variables in the model constant, if a city is on the Nielsen / NetRatings Most Wired list, their e-government rating will go up by 5.39 points ($p \leq 0.024$-tail).

One side note, there were some interesting variables that were tested, found to be not significant, and not included in the model (table 2). One of these variables was New Public Management (NPM) Mayor. In 2002, the Center for Competitive Government at Temple University identified mayors of the New Public Management (NPM) movement (public administration term, run-government-like-a-business model) in their "The New Public Management: Lessons from Innovating Governors and Mayors." Using the mayors identified in the book, a dummy NPM mayor variable was created to see if the movement might impact level of e-government adoption; it did not.

In regards to the model in general, the r-square is .3418 and adjusted r-square is .2511. This means that 25% of the variation in e-government rating is attributable to the independent variables tested in our model. Most likely, the

adjusted r-square of .2511 is due to omitted variables and the fact that e-government and the use of information technology, in general, is still such a new field. In regards to omitted variables, this is always a potential problem, but given that the variables tested were selected using previous literature, possibly other rationales can be used to select other variables for future research. Also, because Information Technology is still a relatively new field, the true levels of consumer use and producer offering have not yet been closely met. It is believed that when future studies similar to this paper are carried out, allowing e-government and Information Technology to settle into their true niche, they will be able to offer more characteristics that may lead to e-government innovation (a sentiment shared by Andrew Leigh in his work, "Digital Divide and Broadband Divide – Some Multiple Regression Results").

5. Conclusion

The use of e-government by urban governments is still in its infancy. Even so, it is important to analyze urban e-government innovation and the reasons for it today. This paper has defined e-government, outlined non-market failure which is believed to be a factor in e-government provision, offered factors for government innovation proposed by previous literature, and used regression methods to find significant urban characteristics which may lead to higher levels of e-government adoption by US cities. The factors of e-government found to be significant were the city's structure, the amount of white collar workers in the city, and the level of internet connectivity by a city's citizens. These findings add to the ever-growing field of study on e-government and individually would make for interesting additional research. With further study of the topic of urban e-government, as technologies continue to advance, cities will be able to more effectively use it as a tool for better governance in the ever-changing urban landscape.

Table 1: Descriptive Statistics for Variables of the 67 Cities

Variable	*Mean*	*Std. Deviation*	*Min. Value*	*Max. Value*
E-Gov. Rating	59.4209	11.06441	44.8	89.5
City Structure - (note: dummy - Mayor - Council System, reference)	0.4925373	0.5037175	0	1
Percent White Collar	38.09642	4.062046	26.77596	48.56767
Top 25 - Wired City (note: dummy – on list, reference)	0.3731343	0.4872875	0	1
Party of Mayor (note: dummy - Democrat, reference)	0.7164179	0.4541382	0	1
Percent White	72.18574	14.67467	20.92424	98.02931
Percent African American	15.42807	13.55315	0.8057896	65.07409
Percent Hispanic	14.06465	15.90221	0.6794423	78.68021
Median Age	34.62388	2.539511	28.6	41.2

Table 2: Regression of E-Gov. Rating on City Structure, Percent White Collar, Wired City, Party of Mayor, Percent White, Percent African American, Percent Hispanic, Median Age

Independent Var.	*Coef.*	*Std. Error*	*T-Stat.*	*Prob.*
City Structure - (note: dummy - Mayor - Council System, reference)	4.439106	2.597262	1.71	0.093 (2-tail)
Percent White Collar	1.062025	0.3505168	3.03	0.004 (2-tail) 0.002 (1-tail)
Top 25 - Wired City (note: dummy – on list, reference)	5.393795	2.651586	2.03	0.047 (2-tail) 0.024 (1-tail)
Party of Mayor (note: dummy - Democrat, reference)	-1.129025	2.822343	-0.40	0.691
Percent White	-0.0656144	0.1213851	-0.54	0.591
Percent African American	-0.1535285	0.1363319	-1.13	0.265
Percent Hispanic	0.0616238	0.1027578	0.60	0.551
Median Age	-0.5058535	0.5457257	-0.93	0.358
Constant	39.32431	28.19061	1.39	0.168

N Observations	67
R - Square	0.3418
Adj. R - Square	0.2511
F (8,58)	3.77
F-Prob.	0.0013

Notes on Regression:

- E-Gov rating was regressed on other independent variables [diversity (all racial groups, and combinations), those 25 and older with a bachelors degree, those 25 and older with graduate degree, those 25 and older with associates degree, those 25 and older with high school degree] - all were found to be insignificant.
- Median income of the city was not included in model. It was found to be closely correlated with Percent White Collar (.5337).
- Education levels of the city were not included in model. They were found to be closely correlated with Percent White Collar. Percent White Collar to Percent with Bachelors Degree (0.8421), Percent White Collar to Percent with Graduate Degree (0.7366).
- Given that income and age variables are often non-linear, logs of income and age were taken and E-Gov was regressed on their logged forms - all were found to be insignificant.
- The regression was also run with robust std. errors, to correct for heteroscedasticity – not significant change in the model was found.
- Due to the nature of the data and subject, it was assumed (and tested for) that there is not auto/serialcorrelation with the independent variables.

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