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ABSTRACT

This study examines the stages of development for county-level e-government implementations in the United States for 344 randomly selected websites. Population size, poverty levels and income levels were examined. Results indicate that most counties have some form of e-government but counties with smaller populations are more likely to have only an online presence with no citizen interaction.

Keywords

E-government, e-democracy, e-services

INTRODUCTION

E-government is defined as the use of information and communications technology, such as the Internet, to improve the processes of government (Gordon, 2002). He further defines e-democracy as the application of information and communication technology to improve the public opinion formation process central to government's primary regulatory function. In December 2002, the U. S. E-government Act of 2002 was enacted to improve the management and promotion of electronic government services and processes. Watson and Mundy (2001) state, "democracy is effective when there is an unimpeded flow of information between citizens and government and there is a high level of authentic citizen participation in the political process." The Internet along with faster and easier access to websites has made e-government, and thus e-democracy, available worldwide. The remaining question is how well citizens are being served by e-government.

Several papers have been published regarding fully functional e-government. Prior to the enactment of the 2002 E-government act, Layne and Lee (2001) presented a theoretical model for measuring the progress of e-government development. The model had four stages that began with cataloging and ended with horizontal integration among agencies. Layne and Lee did not attempt to actually measure how successful actual government entities were, but they did produce a model for measuring progress. Hiller and Belanger (2001) developed a theoretical model for measuring progress and defining relationships between government and citizens, businesses and other governments. Reddick (2004) evaluated empirical models to actually measure the growth of e-government using aspects of both the Layne and Lee model and the Hiller and Belanger model. His process involved survey data collected from municipal administrators and concluded that many municipalities had progressed to a stage of providing some interaction with citizens, but few had progressed to a point of horizontal or vertical integration. More recently, Carrizales (2008) attempted to identify what managers thought were the critical factors specific to e-democracy using a survey. He concluded that e-democracy is still more ideological than a functional innovation, echoing conclusions reached by West (2004) when he surveyed state and federal e-government progress.

But where Reddick, Carrizales, and others place their focus is development in cities, states and federal governments (see www.insidepolitics.org; www.privacyinternational.org/foi/foisurvey2006.pdf; Clift, 2000; Clift, 2007; Graafland-Essers et al, 2003; Scott, 2006; Scott, 2005, Weare et al, 1999; Edmiston, 2002). While it is easy to argue the cost-effectiveness of measuring e-government and e-democracy progress for large concentrations of people (cities, states and federal government),

citizens in rural communities should be no less served by their local governments. According to the 2000 Census data, twenty-one (21%) of the United States population lives in rural areas (Bishaw & Iceland, 2003). Rural communities are serviced by county level governments. And, many rural communities are an important part of homeland security – producing the food supply (Zweig, 2004). Yet, county level government has been largely ignored in terms of analyses of e-government and e-democracy progress. This paper is an attempt to rectify the oversight by specifically analyzing county e-government implementations. The following section reviews the literature on growth-stages in e-government. After that, the study's research methodology is presented. Finally, results are discussed along with an overall assessment of the current stage of e-government at the county-level.

LITERATURE REVIEW

The E-government Act of 2002 established a framework of measures for Internet-based information technology to improve citizen access to government information and services. Prior to the E-government Act of 2002, Layne and Lee (2001) developed a theoretical model for measuring the progress of e-government. They outlined four stages of e-government development based on prior Information and Communication Technology (ICT) models. The first stage, cataloguing, involves placing information and documents online. The second stage involves the incorporation of transactions into an online environment, such as paying taxes online. The third stage involves sharing information all government entities and is referred to as vertical integration. The fourth stage allows government entities to share information with other agencies. This concept of horizontal integration would allow an individual to pay taxes and fees to various government entities and register to vote, all in one sitting. Layne and Lee's model provided a mechanism allowing individual and governmental organizations to measure and compare progress towards various levels of e-government implementation. Hiller and Belanger (2001) proposed a five stage model: information dissemination, two-way communication, online transactions, integration and participation. This model is similar to the Layne and Lee model but is extended by defining relationships involving government as Government to Citizen (G2C), Government to Business (G2B) and Government to Government (G2G).

Reddick (2004) combined the models developed by Layne and Lee (2001) and Hiller and Belanger (2001) to design a study to empirically measure municipal-level e-government progress. The study used results from surveys from municipal administrators. He found that little progress had been made regardless of the population size for both stages and all relationships categories.

While it is important to have an overall analysis of local government implementations, it is also important to understand the progress for counties, separate from cities and towns. Unlike people living in urbanized centers, many rural citizens do not have the same access to public transportation systems to get to services such as county meetings or voter registration as their urban counterparts. While many government services can be processed by mail, the ability to use online technologies can reduce anxiety over concerns such as "what happened at the meeting?", and "did my payment get there?" and "was it on time?" Thus it is important to realize how far county governments have progressed in their e-government implementations. For example, research conducted for the Mississippi Association of Planning and Development Districts in 2000 (Reithel, et al., 2000) found that:

- 51% of counties used dial-up modems as their principal means of accessing the Internet
- Most counties did not have a web presence
- Few counties offered electronic-mail services for employees

While the Reithel study focused only on Mississippi, the question remains how well county governments have progressed in e-services implementations.

This current study is an attempt to determine where U. S. county governments are in terms of their e-government implementations. It is similar to the previous studies as it is an attempt to analyze e-government level of implementation but different in that the focus is specifically on county level government. Also this study does not rely on an administrator's response; instead 344 counties were randomly selected from the 3,140 existing counties or parishes. Their websites were visited and rated by three evaluators to ascertain whether the county had a website and if so, the degree to which the site supports e-democracy for its citizens using some of the factors cited in the study by Reddick. Because websites for government are sanctioned and paid for by the local government, the site itself serves as an indicator of the level of information and interaction a government has made available to its citizens.

The research questions in this study are designed to determine the stage of e-government growth for county-level government. At a practical level, county administrators need an independent analysis of their local e-government implementations, and how their implementations compare to other counties of similar size and composition. If they are less developed than other local governments, they can use the factors used in this study to aid in future development projects. Ultimately, this study attempts to provide a contribution to existing literature on the adoption of ICT by organizations with a specific focus on e-government and e-democracy.

RESEARCH STUDY AND METHODOLOGY

The purpose of this study is to measure the current level of e-government implementation in rural counties in the United States. The research question is whether population size, poverty level and median household income are significant to the level of implementation for a particular county government. The study has twelve hypotheses based on those three factors. The assumption is that there is a negative relationship between poverty level, median income, and population, and each of the four stages of e-government development because of the possible lack of investment in e-services for rural populations. This results in twelve hypotheses. For example:

- Hypothesis 1 from the Poverty Level group would state: The relationship between poverty level and stage I development is negative, that is, counties with poverty levels below the national level would have a lower level of stage I development than counties at or above the national level.
- Hypothesis 5 from the Median Household Income group would state: The relationship between median household income and stage I development is negative, that is, counties with median incomes below the national average would have a lower level of stage I development than counties at or above the national average.
- Hypothesis 9 from the population group would state: The relationship between population and stage I development is negative, that is, counties with populations at or below 100,000 would have a lower level of stage I development than with populations above 100,000.

The twelve hypotheses are presented in Table 1: Statement of Hypotheses.

Stage	Poverty Level	Median Household Income	Population
I	H1: Negative relationship	H5: Negative relationship	H9: Negative relationship
II	H2: Negative relationship	H6: Negative relationship	H10: Negative relationship
III	H3: Negative relationship	H7: Negative relationship	H11: Negative relationship
IV	H4: Negative relationship	H8: Negative relationship	H12: Negative relationship

Table 1: Statement of Hypotheses

This study sought to determine the level of adoption and stage of development of e-government implementations at the county government-level in the United States. The research compared the online presence of a sample of county governments using a modified stage measurement instrument derived from models of Layne and Lee, Reddick, Watson and Mundy, and Hiller and Belanger. A total of 344 counties were randomly selected from U.S. Census Bureau's list of 3,140 counties. The target minimum number of available sites was 342 to ensure a confidence level of 95% in statistical significance tests.

The study used four stages of e-development from the Layne and Lee study as the primary basis for categorization, and then included or excluded factors introduced by the other models to ensure a thorough and fair examination of county-based governments. For example, the Reddick model included analysis of utilities, but a quick phone call to twelve random counties revealed that less than half manage their utilities. Further, less than a third had public recreational facilities. Both utilities and recreational facilities payments were included in the Reddick study which may have biased the results towards entities with such facilities. The data collected for each website included the items listed in Table 2: Data Analyzed for County Websites.

Stage	Question Number	Question
I	1	Does the county have a website?
If so, does the website have:		
I	2	Current information/news for voters/residents (e.g., meeting minutes, current job openings)
I	3	Additional information/news for businesses
I	4	Forms can be downloaded for manual completion (e.g., voter registration)

II	5	Online payment of taxes
II	6	Online payment of fines or fees
II	7	Online completion and submission of permits
II	8	Online completion of business licenses
II	9	Online requests for local government records
II	10	Online delivery of local government's records to the requestor
II	11	Online voter registration
II	12	Online communication with individual elected and appointed officials
II	13	Online requests for services
III	14	Evidence of vertical integration- information sharing between different levels government agencies (e.g., criminal history has local, state and federal information; person access state and local taxes owed with one search)
IV	15	Evidence of horizontal integration-information sharing between different local agencies (e.g., person can view property taxes, fees, etc owed as an example)

Table 2: Data Analyzed for County Websites

All of the questions were rated using a yes or no answer. No attempt was made to measure the level of implementation for a particular factor as there are different types of implementation, of which some are more sophisticated and complex than others. For example, a county may have a site that allow residents to request hookup for new services or to fix potholes in the road while another's site only allow a person to report a problem. The factor was re-coded as one (1) if the question answer was yes and zero (0) if the answer was no. Each county was examined by three individuals. To ensure consistency of understanding, specific examples were provided to the evaluators. For example, communication with elected or appointed official had to include an email address for either elected or appointed officials, though not necessarily both. Local records could include any type of government records such as criminal records or property records. Fees or fines could include business fees, traffic fines, etc. The 2008 American Community Survey 1-Year Estimates from the U.S. Census Bureau (www.census.gov) was consulted for the most recent population, poverty levels, and median income data.

After ratings were collected for each factor, each website was evaluated for stage I, stage II, stage III and stage IV development. Questions 1, 2, 3 and 4 were used to measure stage I. Questions 5 through 13 were used to measure progress towards stage 2. Question 14 was used to measure progress toward stage III, and Question 15 was used to measure progress toward stage IV. The maximum total stage score for stage I development was four (4), stage II was nine (9), stage III was one (1) and stage IV was one (1). The descriptive statistics are shown in Table 3: Descriptive Statistics of Stages of E-Government Implementations - Counties with an E-presence.

	Counties with E-Presence			
	N	Mean	Min	Max
Stage I	259	2.78	1	4
Stage II	259	2.85	0	9
Stage III	259	0.12	0	1
Stage IV	259	0.05	0	1

Table 3: Descriptive Statistics of Stages of E-Government Implementations - Counties with an E-presence

Table 3 suggests that some of the counties selected for the study have made some progress towards all of the stages of e-services. For example, a mean of 2.78 for stage I development is indicates that the evaluators were answer yes to almost three out of the four questions for stage I. The progress, however, declines significantly after stage I. The mean for stage II indicates that evaluators were only able to find almost three out of the nine services for stage II. Counties without a website were excluded from the analysis in Table 3.

Further information about the countries is depicted in Table 4: Descriptive Statistics for Selected Counties. Representation was not equal across geographical areas. Nineteen percent (19%) of the counties were from the northeast, forty-seven percent (47%) were from the south, and thirty-four (34%) were from the west. Eight-five percent (85%) had a median income less than the national average and sixty-one percent (61%) had a poverty level higher than the national level.

Table 5: Comparison of web presence and poverty levels, and Table 6: Comparison of web presence and median income, describe the selected counties in terms of web presence, poverty level and income. It is clear from Table 5 that regardless of the poverty level the majority of counties have some type of web presence. However, no county with an income above the national average was without web presence. The number of counties that had both a poverty level higher than the national level and a median income higher than the national average was only 4.

Variable	Percentage	Number of Observations equal to 1
have Website	75%	259
Northeast	19%	66
South	47%	160
West	34%	118
Median Household Income less than National Average	85%	294
Poverty level higher than the National Level	61%	209
Population over million	1%	3
Population between		
500,000 and million	1%	3
250,000-499,999	3%	11
100,000-249,999	5%	18
50,000-99,999	8%	26
10,000-49,999	25%	86
5,000-9,999	48%	165
Population under 5,000	2%	6

Table 4: Percent and Number of Counties Fitting the Descriptions (out of 344)

	No website		Website		Total
Poverty level	*Number of Occurrences*	*Percent of Overall Total*	*Number of Occurrences*	*Percent of Overall Total*	
At or Below the National Level	18	5%	117	34%	135
Above the National Level	67	19%	142	41%	209
Total	85	25%	259	75%	344

Table 5: Comparison of web presence and poverty levels

Median Income	No website	Website	Total
Higher than the national average	0 (0%)	12 (3%)	12 (3%)
At or lower than the national average	85 (25%)	247 (72%)	332 (97%)
Total	85 (25%)	259 (75%)	344 (100%)

Table 6: Comparison of web presence and median income

Those counties with websites and where more than half the websites had downloadable forms are illustrated in Table 7: Percent of Counties with a web presence providing the described e-service.

Question	Question Text: Does website have:	Percent
Q2	Current information/news for voters/residents	70
Q3	Additional information/news for businesses	46
Q4	Forms can be downloaded for manual completion (e.g., voter registration)	62
Q5	Online payment of taxes	36
Q6	Online payment of fines or fees	28
Q7	Online completion and submission of permits	27
Q8	Online completion of business licenses	25
Q9	Online requests for local government records	42
Q10	Online delivery of local government's records to the requestor	42
Q11	Online voter registration	16
Q12	Online communication with individual elected and appointed officials	63
Q13	Online requests for services	6
Q14	Evidence of vertical integration	12
Q15	Evidence of horizontal integration	5

Table 7: Percent of Counties with a Web Presence Providing Described e-Service

A correlation was computed between poverty level and income with the assumption that lower poverty levels would be positively correlated with higher incomes. Using the variables "income above the national average" (1 if yes, 0 if no) and "poverty level below the national level" (1 if yes, 0 if no), the correlation was 0.446 and was significant at 0.01 using a one-tailed Pearson correlation. The results of the correlation test indicate that since both are significantly correlated, one can assume that independent tests of each against the stages of development should yield similar results. The same presumption cannot be made for population size because population in a county could be small due to large farming operations. To ensure there was no correlation, the analysis was run using a two-tailed Pearson correlation. As expected there was no significant relationship between "Population under 100,000" and income or poverty level. This is depicted in Table 8: Correlation Table of Income, Poverty and Population Size.

		Higher Median Income than the National Average	Lower Poverty than the National Level
Lower Poverty than the National Level	Pearson Correlation	0.45	
	Sig. (2-tailed)	0.00	
Population Below100,000	Pearson Correlation	(0.03)	(0.07)
	Sig. (2-tailed)	0.31	0.10

Table 8: Correlation Table of Income, Poverty and Population Size

Previous research suggests that the more integration and automation of services for government, the closer it is to providing access to e-democracy (West, 2004). However, county governments often manage only the areas not served by a municipality and, therefore, tend to serve the more rural communities. Providing access to services and local officials in rural communities

can be a significant move to indicate a true progression towards e-democracy because providing services, even e-services, in a rural community means shifts in attitudes towards access as well as county business processes. In such a setting, government becomes transparent and accessible to everyone, regardless of where they live.

RESULTS

As shown in Table 3, 81 percent of the selected counties had a poverty level below the national level and only 19 percent had a median income at or above the national level. In addition, Table 7 illustrates those counties with websites and that more than half the websites had downloadable forms. Almost all the sites provided general information and news to the public including meeting minutes, and strategic plans. Although almost none of the sites provided a venue to request services, many provided some venue for communicating with local officials via the Internet (63%).

Several analyses measured the current status of e-services. Reddick's 2004 study was used for comparison. Although Reddick studied both counties and municipalities, the majority of his respondents were smaller municipalities. While still comparing two disparate groups, his is the only published study in which some measure of progress is empirically documented. He measured community size but did not study poverty or income. Reddick found that minimal progress had been made for any of the stages. He found an average of 3.54 with a range of 0 to 9 for stage I, and an average of 2.28 with a range of 0 to 15 for stage II (p 73). Because many of the factors studied in Reddick's model did not apply to county governments as a whole, county results may have skewed his results.

The first analysis in this study was to generate a binary logistic model to determine whether any of the factors, location, population, poverty level or income had an effect on the existence of a county web presence. The assumption was that lower income communities or smaller communities may not believe a web presence is feasible due to the cost of construction and maintenance. The Omnibus tests of Model coefficients provided a chi-square of 24 which was significant at the .05 level (.012). The classification table is presented in Table 9: Binary Logistic Model. Only lower poverty had a significant effect on whether or not a county had a web presence.

Variables	B	S.E.	Sig.
Northeast	(0.40)	0.38	0.29
South	(0.30)	0.30	0.32
— Population over million	(1.14)	1.72	0.51
Population between			
— 500,000 and million	(0.85)	1.74	0.63
— 250,000-499,999	0.60	0.89	0.50
— 100,000-249,999	0.67	0.72	0.35
— 50,000-99,999	0.08	0.55	0.88
— 10,000-49,999	0.60	0.40	0.14
— 5,000-9,999	0.26	0.35	0.46
Higher Median Income than National Average	0.95	0.58	0.10
Lower Poverty than National Level	**0.85**	**0.32**	**0.01**
Constant	0.66	0.36	0.07

Table 9: Binary Logistic Model

Having a poverty level lower than the national level had a positive effect on whether or not a county had a web presence. Higher median income than the national average had a significance factor of 0.1 which means it was not as influential as poverty level but it does have more significance than population or location. The results of the logistic model support the assumption both median income and poverty level have an effect on whether or not a county has a web presence.

Next, the study determined the correlations between stage development, population, income and poverty level. For the correlation analysis, poverty level and median income values were reversed so that the correlations were calculated based on poverty levels higher than the national level and median income lower than the national average. The correlations are shown in Table 10: Stage and Factor Correlations. Correlations significant at the 0.05 or lower level are bolded. In this sample, the only significant relationships were between:

(1) Poverty level and stage I and stage II development,
(2) Median income and stage I and stage II development, and
(3) Population and stage IV development.

With the exception of the correlation between median income below national average and stage 4, all the correlations were either zero (0) or negative.

	Poverty Level Higher than National Level	Median Income Below National Average	Population Below 100,000
I	***(0.24)***	***(0.27)***	(0.01)
II	***(0.20)***	***(0.29)***	0.00
III	(0.03)	(0.02)	(0.06)
IV	(0.01)	0.03	***(0.11)***

Table 10: Stage and Factor Correlations

The hypotheses stated there would be negative correlations between population, median income below national average, poverty level higher than national average, and the four stages. A summary of the results of the current study's hypotheses is found in Table 11: Summary of Study's Hypotheses

Stage	Poverty Level Higher than National Level	Median Income Below National Average	Population Below 100,000
I	***Fail to Reject***	***Fail to Reject***	Reject
II	***Fail to Reject***	***Fail to Reject***	Reject
III	Reject	Reject	Reject
IV	Reject	Reject	***Fail to Reject***

Table 11: Summary of Study's Hypotheses

The results suggest that poverty level and median income have a negative effect on stage I and stage II progress, and counties with smaller populations have a negative effect on stage IV development. Stage III involves vertical integration with state and federal government agencies. For example, if a state is going to make its data accessible to one local government, it would make it available to all of them. Thus, income, population and poverty level should not be important. For stage IV, though, the integration is between and among the government's own agencies. Due to costs it seems likely that counties serving larger populations would be more engaged in stage IV development than the smaller ones. It is important to note that poverty level and median income have negative effects. This suggests that the poorer county residents are less likely to have access to e-government. Hence, this population is given fewer opportunities to be engaged in government interaction than their counterparts, e.g., people in communities with higher median incomes, lower poverty levels and/or larger populations.

CONCLUSIONS AND NEXT STEPS

This study reviewed county website status as of January 2010. Overall the results of the study are consistent with expectations that county level governments in the United States have made little progress in e-services development regardless of population size, median income or poverty level. While most counties do have a web presence, this study

provides empirical evidence based on a significant sample that many still only have limited access to government through electronic means. Even without specific comparative studies, it is clear that the progress for counties has not been consistent. In fact, several of the websites visited had not been updated since the initial implementation which for some was as early as 2004. However, a disadvantage of this study is that it does not take into consideration certain barriers such as data security or citizen preference for dealing with government in person (Vassilakis et al, 2005, Teo et al, 2009).

There are several next steps for this research. One is to continue to monitor the adoption of e-government practices and to measure movement towards e-democracy as opposed to just e-services for rural communities. For example, the effort to find information about how to register to vote or to contact officials was not nearly as easy as it was to find where to pay taxes. Having a web presence is not enough; the web presence must also be about representation as well as about collecting revenue. Further research is needed to identify best practices for e-government sites that elicit trust from the citizenry and provide services that empower and not just collect fees. Additional studies need to be completed regarding progress on all stages of development and on those factors that are important to e-democracy, especially as they relate to access for poor communities and the physically disadvantaged. Finally, additional analysis needs to be completed comparing rural versus urban e-presence progress as well as comparing progress across states and nations.

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