

# Local E-Government Trends

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Evaluating the Adoption and Sophistication of  
Kentucky City Websites

**Kevin Klosterboer**

Public Administration Capstone

Martin School of Public Policy and Administration

University of Kentucky

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## Executive Summary

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With the prevalence of internet technologies and e-commerce, citizens' expectations for online e-government services are growing. Numerous studies have been conducted on the worldwide adoption and sophistication of national governments' e-government websites and state websites in the United States, but previous studies of local governments have been limited to looking at nationwide samples of the largest cities. By presenting a statewide analysis of all Kentucky city websites, I expect that my findings will provide valuable information about how cities of all sizes are using web-technologies to provide services to their citizens. I examine which types of cities, organized along several demographic variables, have implemented websites of any kind, and which of these cities have invested in sophisticated websites that enable two-way communication and facilitate online transactions.

The findings show that less than 35% of Kentucky cities have websites at this time. Cities with websites have, on average, larger populations. The cities with websites also have lower median ages; lower percentages of whites, English-only speakers, home ownership, and registered Democrats; and higher city revenues and per capita revenues. Cities with even larger populations and city revenues to provide more sophisticated websites through online communication and transaction capabilities than smaller cities that provide basic websites. Lack of Internet connectivity in smaller cities also impedes the ability of citizens to use on-line services.

Multivariate regression analyses were conducted to determine the effect of several demographic characteristics on e-government adoption and sophistication for Kentucky cities. Not surprisingly, statistically significant indicators for both adoption and sophistication include the city manager and mayor-council forms of government, internet availability, median age, and per capita revenue. City population was a significant indicator only for sophistication. More surprisingly, holding all other variables constant, the proportion of registered voters who are Democrats was found to have substantial impacts on both adoption and sophistication. Previous literature does little to address why this may be so.

## Introduction

The Internet and web-based technologies continue to expand and evolve, as thousands of companies invest billions of dollars to figure out the new best way to market their products and services to hundreds of millions of consumers who surf the web each day. Connected to the World Wide Web, consumers can make purchases online: selecting from billions of products from millions of possible vendors; people can stay in touch with family and friends, listen to music, watch television and videos, and engage in political debate all from anywhere in the world. It is clear that more businesses are turning to web applications to tap into the growing online customer base. Universities are using websites to reach prospective students, serve current students, and advance research. Nonprofit organizations are using websites to reach prospective donors and to serve their clients. But why are governments using websites and how are they using sophisticated web-based technologies to serve their citizens? An estimated 213.6 million US citizens use the internet an average of 32.6 hours each month so it makes sense that governments would want to develop web-based applications to reach their citizens where their citizens are: the World Wide Web<sup>1</sup>. In this age where web-technologies abound it is important to understand how and why governments use websites.

With the pervasiveness of Internet technologies and the prevalence of online shopping, expectations for online transactions with governments are growing (Blackstone, Boganna & Hakim 2005). Numerous studies have shown that national governments around the world are successfully implementing websites that allow their citizens to interact with various federal offices and departments online (i.e. Graafland-Essers & Etedgui 2003; United Nations 2005, 2008; West 2008a). Similarly, previous research has found that all state governments have websites where citizens can find information and complete online transactions (i.e. Gant & Gant 2002; McNeal, Tolbert, Mossberger & Dotterweich 2003; West 2008b). For local governments, however, the few previous studies have mainly

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<sup>1</sup> These statistics are taken from estimates prepared by comScore Metrix, July 2010. <http://www.comscore.com>.

focused on nationwide or international samples of the largest cities, which as expected all offer sophisticated e-government websites (i.e. Kaylor et. al. 2001; Urban, F. 2002; Kaylor 2005). I expect that by presenting a statewide analysis of Kentucky city websites, my findings will provide valuable information about how cities of all sizes are using web-technologies to provide services to their citizens.

In this paper, I investigate which demographics of municipalities in Kentucky make them likely to turn to web-based technologies to provide online services to their citizens. I summarize the demographics that make a municipality likely to invest in implementing web-based service provision. I also look at the sophistication of these web services: which municipalities have sophisticated e-government capabilities that allow online financial and serve transactions, and which do not. Using regression analysis, I then link these results to demographic differences between communities. This is an important first step in answering the larger question of whether or not there is room for more municipalities to utilize sophisticated e-government services to improve service provision to their citizens.

### **Research Question**

Surveying Kentucky city websites can provide valuable insight into how various types of cities are using web-based e-government technologies to serve their citizens. In this paper I examine which types of cities, organized along several demographic variables, have implemented websites of any kind, and which of these cities have invested in sophisticated websites that enable two-way communication and facilitate online transactions.

### **Literature Review**

Electronic government, or "E-Government," has been a rising topic for public administrators since Internet technologies exploded into the 1990s. The Internet is not the first communications technology to have a drastic impact on the workings of government, but Internet technologies have

been adopted much more quickly than the telephone, radio, and television technologies of the past. Attempting to theorize the changes that e-government has had and will continue to have on governments, several dichotomies have been drawn between the traditional models of public administration and the new customer-service models driven by online service provision (Ho 2002; Melitski 2003; Musso, Weare & Hale 1999).

Melitski (2003) outlines two competing paradigms that frame how governments operate their e-government service: the Information Technology (IT) paradigm and the public administration (PA) paradigm. The IT paradigm arose during the 1980s and early 1990s. During this time, before the advancement of the Internet, governments' IT functions were limited to a few large mainframe computers which could be used only by technically trained IT managers. Since these IT managers were the sole users of the government technologies, they planned, designed and implemented technologies based on their preferences and technical abilities alone. The newer PA paradigm, on the other hand, arose with the widespread adoption of the Internet in the late 1990s into the twenty-first century. As more and more people began using the World Wide Web, technical knowledge grew among government employees and citizens. As employees and citizens became familiar with technologies, they began demanding increased e-government services.

Though these two distinct paradigms developed decades ago, they both still remain in conflict today. In the IT paradigm, sophisticated technologies provided through e-government are rationally analyzed for efficiency and effectiveness in delivering services to the citizens. Technologies are evaluated based upon cost, upon how they will help the government streamline processes, and upon whether the IT managers have the skills and abilities to develop. The new PA paradigm, on the other hand, focuses new technologies on the demand from the citizens, placing less emphasis on rational analysis. Research from other authors has continued to focus on the new customer-service centered

approach that many governments have adopted. The “e-government paradigm” (Ho 2002) and the “entrepreneurial model” (Musso, Weare & Hale 1999) offer similar explanations of how governments have become more focused on serving their citizens as customers as they have begun implementing emerging e-government technologies.

Governments which provide online transaction capabilities for their citizens are utilizing the same technologies that businesses use to connect to their customers through e-commerce. Similarly, as e-commerce continues to expand, it is likely that citizens will expect similar types of online services from their local governments, as asserted by Kratz (2005):

*“The Internet has enabled consumers to shop, obtain information, and conduct business 24-hours a day at their convenience. These experiences have led citizens to expect the same convenience and cost-effective delivery of government services. For the government willing to embrace the digital economy, the results can be very beneficial.”*  
*(Kratz 2005, 207).*

### *Defining E-Government*

An important step in understanding how governments are using e-government services is to define “e-government” for the purpose of this paper. Several definitions exist, each emphasizing different aspects of different technologies that governments use to reach the public. Some authors include internal networking and file-sharing capabilities as a part of the e-government provision (Moon 2002). Brown & Brudney (2004) include in their definition that e-government specifically targets “citizens, business partners, employees and other government entities.” For the purpose of my paper, however, I prefer a broad-based Internet specific definition of e-government like that of West (2004):

*“E-government refers to the delivery of government information and services online through the Internet...Unlike traditional structures, which are hierarchical, linear, and one-way, internet delivery systems are nonhierarchical, nonlinear, two-way, and available 24 hours a day, seven days a week.” (West 2004, 16).*

#### *Previous Studies of Local E-Government*

Surprisingly, though e-government has been researched since the turn of the century, there have been relatively few surveys of e-government at the local level. In 2000, ICMA (International City/County Management Association) partnered with Public Technology, Inc, (PTI) to complete the 2000 Electronic Government Survey. Their survey gathered data from nearly 1,900 local governments, with populations of 10,000 or larger, from across the nation regarding the “extent to which local governments...were engaged in e-government, including such things as having sites on the World Wide Web and providing information and delivering services electronically” (Holden, Norris & Fletcher 2003, 332-3). Holden and his associates (2003) analyzed the survey results and found that 83.6% of responding governments had websites. Wanting to go beyond website adoption, the authors also assessed website sophistication. Less than 3% of responding local governments reported that their websites allowed online transactions, though 49% of those without these services responded that such features were in planning or development.

My methodology for studying the city websites in Kentucky will be similar to Musso, Weare, and Hale’s (1999) study of 270 municipal websites in California. They evaluated the presence and sophistication of e-government websites for Californian cities. A city website was defined in their study to be “any site, either public or privately provided, that includes information about a municipality” (Musso, Weare & Hale 1999, 8). This wide definition of a city website may have been suitable for 1999 when websites were relatively new and sparse, but in my study I will limit a city website to an “official”

city website offered by the city itself. By comparing the sophistication of the websites with various city characteristics, the authors report several findings:

- Cities with websites have larger populations, higher levels of government expenditures and revenues, and higher levels of voter registration;
- Residents of cities with websites are slightly older and of higher socio-economic status, as indicated by higher median income and higher percentage with college education

### *Evaluating E-Government Sophistication*

Two general methods exist for evaluating varying levels of sophistication of e-government websites: the stage method and the function method. The stage method is widely used to describe e-government sophistication by a series of progressive stages of communication (Layne & Lee 2001, Moon 2002, West 2004). Layne & Lee (2001) were among the first to develop a stage-based framework for evaluating e-government websites. The four stages they used are cataloguing, transaction, vertical integration, and horizontal integration. Cataloguing refers to the use of a government's website as an online catalogue presenting information that can be accessed online. Transaction builds upon the catalogue approach and enables web-users to conduct financial or service transactions via a web-based form. The higher stages of vertical and horizontal integration connect the user to opportunities to conduct transactions with higher levels of government or other municipal governments' websites. Through vertical and horizontal integration, citizens are able to access complete "one-stop-shopping," performing all of their e-government transactions, via one government websites.

While integration is the highest stage of sophistication as outlined by Layne & Lee, other authors place online services enabling political participation as the highest stage (Moon 2002; West 2004). E-voting, despite several failed attempts, remains plagued by security threats. Fear of hacking, especially hacking that might remain undetected, to change the outcome of elections remains a major detriment

to the development of e-voting technologies. While e-voting may not be currently feasible with the fears involving protecting sensitive information, it is likely that one day we could see these sophisticated uses of government websites.

### *Characteristics of Internet Users*

Cities with more web users will likely have a higher demand for e-government services. Similarly, cities with many web users will likely see greater benefits from implementing sophisticated websites than cities without many web users. To understand the sophistication of city websites, then, it is important to know which demographics of a population make citizens of that community likely to use the internet.<sup>3</sup>

While investigating American Internet users, Horrigan (2010) found that 78% of adults in the United States regularly use the Internet. Those adults most likely to use the internet are those with a college degree and high incomes, who are not senior citizens, and who are white. Low levels of education or income, being a minority, and being 65 years old or older were found as significant indicators of low levels of internet usage. City-wide demographics which other authors have found significant are type of government structure, total population, percent of the population speaking only English, government revenues, home-ownership rates, and voter registration rates (Holden, Norris & Fletcher 2003; Moon 2002; West 2003).

## **Data and Methodology**

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The 414 Kentucky cities analyzed in this report were drawn from the online membership directory of the Kentucky League of Cities<sup>2</sup>. These cities and their websites were investigated by the

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<sup>2</sup> There are actually 419 cities in Kentucky. Five incorporated cities are not included in Kentucky League of Cities' online membership directory and were thus not included in the sample when the author analyzed the websites.

author during October/November 2010. For those cities with websites, the web content was analyzed according to Moon's five stages of e-government sophistication (Moon 2002). Moon uses a stage method to classify e-government sophistication into five distinct stages. Stage One involves a one-way information exchange, with the government using its website as a virtual bulletin board: a place to post information and distribute it to citizens and visitors. Stage Two involves a two-way information exchange, with the website allowing communication between the government and the user, utilizing chat rooms, contact forms or email technologies. Stage Three is when a web user can complete financial or service transactions online. Examples of Stage Three capabilities would be paying utility bills or scheduling service appointments through web-based applications. Stage Four moves beyond completing transactions with one municipality and incorporates vertical and horizontal integration, with the website becoming a one-stop shop that allows citizens to complete transactions with different governments at once. Finally, Stage Five e-government capabilities involve the ability to complete democratic activities over the internet, such as voting or signing petitions. The precise methodology for determining stage of sophistication is presented in Appendix A. Table 1 provides examples of each stage and describes the technologies required to implement the service.

The main data source for the analysis presented here is the 2009 American Community Survey 5-year Estimates from the US Census Bureau. This data provides the recent data covering all Kentucky cities. The annual one-year estimates of the American Community Survey only include large cities. While the decennial census data is the most precise data available, the 2010 census results were not yet available at the city level at the time of analysis and the 2000 census data is too outdated. Recent data is very important for this study because websites are relatively new technologies and most of the Kentucky cities with websites have likely implemented their web-based e-government in the last few

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Rather than analyze these five cities' websites at a separate time from the main sample, they were just left out. These five omitted cities are Bellemeade, Lone Oak, Wheatcroft, Whitley City, and Woodbury.

years. The 2009 American Community Survey 5-year estimates provide the most recent data for all Kentucky cities. The data on city revenues was acquired upon request from the Kentucky League of Cities. Voter registration statistics were taken from public documents available on the Kentucky State Board of Elections website. These voter registration statistics are county-wide, while all other variables are focused on the city level. Table 2 displays the demographics used in the analysis and the source for that data.

**TABLE 1: Stages of Sophistication to Evaluate E-Government Websites**

Stage	Description	Example	Technologies Used
One	Information: Dissemination/Catalogue	Find hours of government offices	Basic Web technology, bulletin boards
Two	Two-way communication	Request and receive information	Electronic data interchange, email
Three	Service and financial transaction	Pay taxes online	Electronic data interchange, electronic file system
Four	Vertical and horizontal integration	All services and entitlements	Integration of the technologies required for stage 1, 2 and 3
Five	Political participation	Voting online	Public key infrastructure, more sophisticated interface and interoperable technologies

*Adapted from Moon (2003).*

**TABLE 2: Demographic Variables and their Sources**

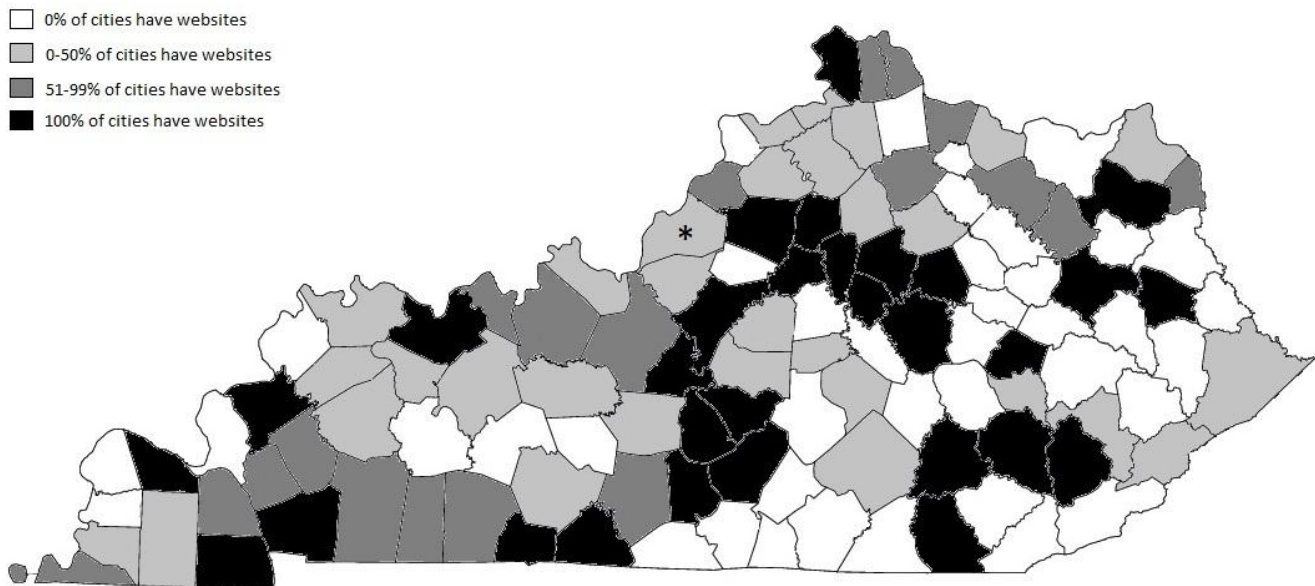
<b>General Demographics</b>	<b>Political Factors</b>	<b>Social/Economic Factors</b>
Population <sup>1</sup>	Percent Voter Registration <sup>2</sup>	Median Income <sup>1</sup>
Median Age <sup>1</sup>	Percent Democrats <sup>2</sup>	Percent Home Ownership <sup>1</sup>
Percent of Population age 65+ <sup>1</sup>		Percent College Graduates <sup>1</sup>
Percent White <sup>1</sup>	<b>City Government</b>	Internet Availability <sup>4</sup>
Percent English-Speakers Only <sup>1</sup>	Revenues, excluding Utilities <sup>3</sup>	
	Per Capita Revenue <sup>3</sup>	

1 – Source: American Community Survey, US Census Bureau; 2 – Source: Kentucky State Board of Elections; 3 – Source: Kentucky League of Cities; 4 – Source: ConnectKentucky

## Empirical Analysis

Of the 414 Kentucky cities, I found that 143, or 35 percent, have websites. Figure A displays a map showing the distribution of cities with and without websites, aggregated into the county level to increase readability. Forty (33.3%) of Kentucky counties do not contain any cities with e-government websites. The counties without any city websites are mainly the rural majorly Western counties. Jefferson County, indicated by an asterisk, has a consolidated form of government wherein Jefferson County/Louisville provides services to county residents. All of the residents are served by this consolidated website, though several of the smaller cities within Jefferson County have separate sites. Jefferson County is not indicated as highly concentrated because many of its cities do not provide a website separate from that of the consolidated government.

**Figure A: Distribution Map of Kentucky Counties Containing Cities with Websites**



*Source: Author's analysis of Kentucky city websites.*

To determine the difference in average demographics between cities with and without websites, I conducted t-tests of difference of means. The results of the t-tests are outlined in Table 3. One of the largest differences is that cities with websites have significantly larger populations. The

average population of cities with websites is 13,728, compared to the average population of cities without websites of just 1,249. Of the seventy-six cities in Kentucky with at least 5,000 people, sixty-five (85.5%) of them have websites. Of the 338 cities with less than 5,000 people, only seventy-six (22.5%) of them have websites.

Another major difference is that cities with websites have much larger annual revenues, excluding utility revenues. The average amount of revenues for cities with websites is \$17.4M, compared to just \$676,600 for cities without websites. Of the ninety-eight cities in Kentucky with at least \$2M in annual revenues, seventy-nine (80.6%) of them have websites.

**TABLE 3: Group Means of Demographic, Political, and Social Variables for Cities with and without Websites**

<b>Variable</b>	<b>Cities without Web Sites n=271</b>	<b>Cities with Web Sites n=143</b>
<b>General Demographic Factors</b>		
<i>Population**</i>	1,249	13,728
<i>Median Age**</i>	40.3	38
<i>Percent of Population age 65+</i>	16.4	15.4
<i>Percent White**</i>	92.9	88.8
<i>Percent English-Speakers Only**</i>	97.2	95.9
<b>Political Factors</b>		
<i>Percent Voter Registration</i>	90.6	90.4
<i>Percent Democrats*</i>	61.4	56.4
<b>City Government</b>		
<i>Revenues, excluding Utilities*</i>	\$676,609	\$17,400,000
<i>Per Capita Revenue**</i>	\$439	\$766
<b>Social/Economic Factors</b>		
<i>Median Income</i>	\$43,460	\$43,160
<i>Percent Home Ownership**</i>	71.7	64.2
<i>Percent College Graduates</i>	26.4	28.7

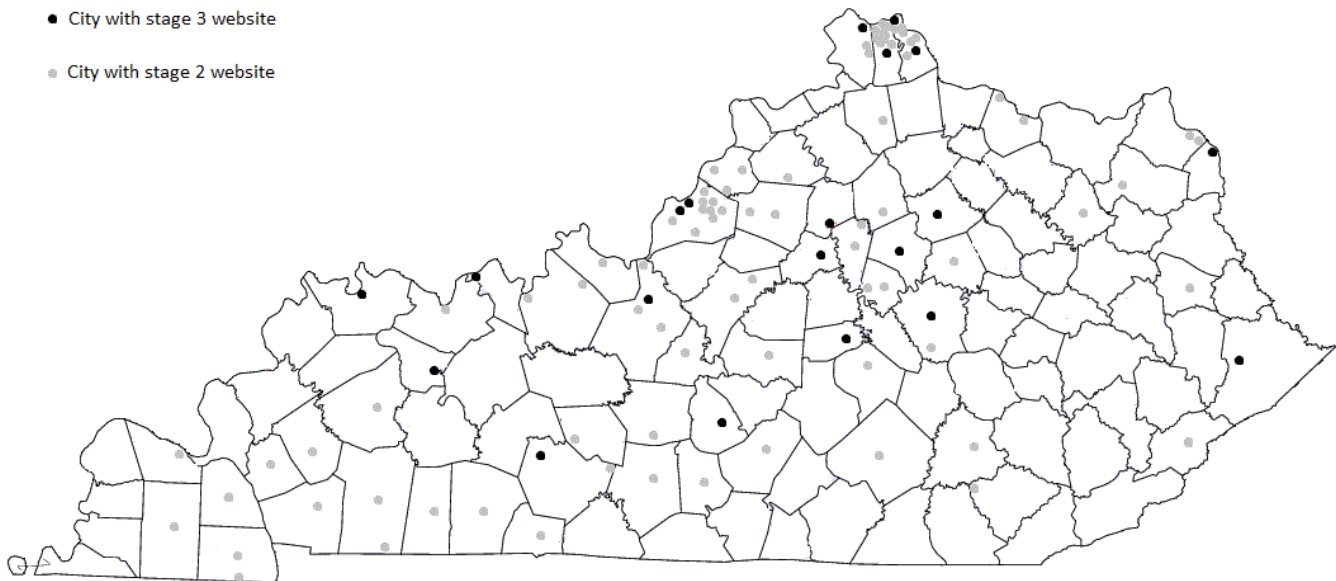
Source: Author's analysis of data gathered from American Community Survey 5-year Estimates. Revenue data gathered from the Kentucky League of Cities.

\*T-test of difference of means significant at 1% level.

\*\*T-test of difference of means significant at 0.1% level.

Of the 143 cities with websites, thirty-seven had Stage 1 sophistication, eighty-five had Stage 2 and twenty had Stage 3. Figure B displays a map showing the cities with Stage 2 and Stage 3 e-government sophistication. A high proportion of cities with Stage 2 and Stage 3 sophistication are in the high population areas surrounding Cincinnati in the north, Louisville in the northwest and Lexington in the central part of the state.

**Figure B: Distribution Map of Kentucky Cities with Websites Displaying Stage 2 and Stage 3 Sophistication**



*Source: Author's Analysis of Kentucky City Website Content.*

To determine the demographic differences between cities with different levels of website sophistication, I used analyses of variance (ANOVA) tests. The results of these tests are displayed in Table 4. Cities with more sophisticated e-government are, on average, larger in population. These providers of sophisticated websites also have lower median age; lower percentages of whites, English-only-speakers, home ownership, and registered Democrats; and higher city revenues and per capita revenues.

**TABLE 4: Group Means of Demographic, Political and Social Variables  
for Cities with Various Stages of Website Sophistication**

<b>Variable</b>	No Website n=272	Stage 1 n=37	Stage 2 n=85	Stage 3 n=20
<b>General Demographic Factors</b>				
<i>Population**</i>	1,248	2,815	8,590	58,913
<i>Median Age**</i>	40.4	38.9	37.7	36.7
<i>Percent of Population age 65+</i>	16.4	16.4	15.2	13.9
<i>Percent White**</i>	92.9	91.7	87.7	87.4
<i>Percent English-Speakers Only**</i>	97.2	96.8	95.6	94.9
<b>Political Factors</b>				
<i>Percent Voter Registration</i>	90.5	90.2	90.8	89.6
<i>Percent Democrats*</i>	61.4	58.3	54.9	58.8
<b>City Government</b>				
<i>Revenues, excluding Utilities**</i>	\$677,074	\$2,175,699	\$8,425,413	\$87,100,000
<i>Per Capita Revenue**</i>	\$439	\$710	\$765	\$887
<b>Social/Economic Factors</b>				
<i>Median Income</i>	\$43,530	\$33,600	\$46,822	\$44,185
<i>Percent Home Ownership**</i>	72.0	61.9	64.9	61.5
<i>Percent College Degree</i>	26.5	21.1	31.1	31.5

*Source: Author's analysis of data gathered from American Community Survey 5-year Estimates. Revenue data received from Kentucky League of Cities.*

*\*ANOVA test of difference of means significant at 1% level.*

*\*\*ANOVA test of difference of means significant at 0.1% level.*

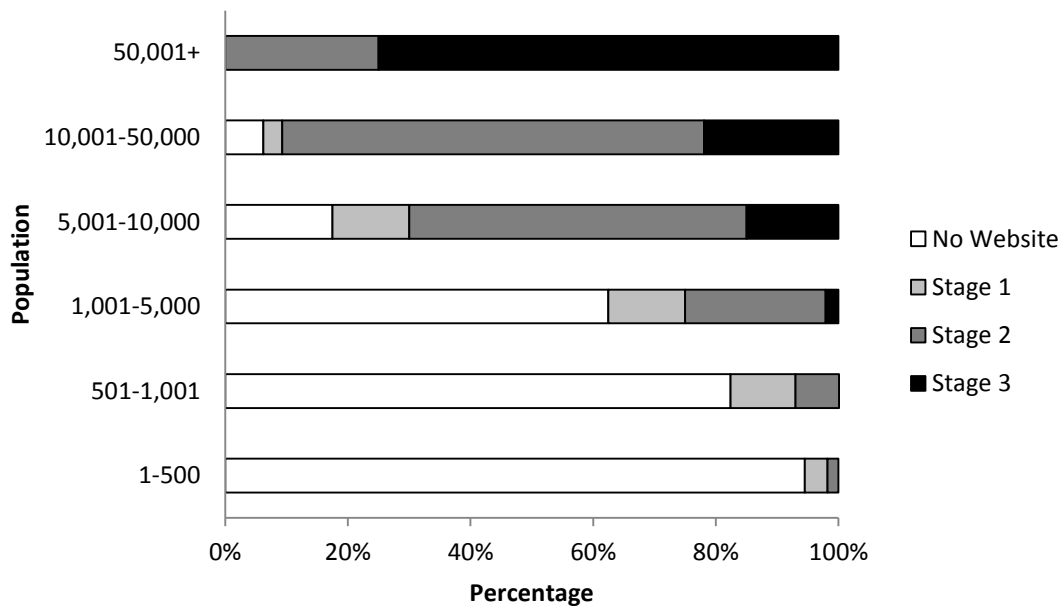
The two variables with the clearest relationship with e-government sophistication are city revenues and population. When these variables are cross tabulated with stage of sophistication, the relationships are easy to see. Table 5 presents e-government sophistication for cities within different categories of population. Figure C presents the same information in a graphical form. It is clear from Table 5 and Figure C that cities with larger populations have more sophisticated websites. This seems reasonable since, as discussed above, a larger population can be interpreted as increased demand for e-government services.

**TABLE 5: Cross-Tabulation of Website Sophistication by Population**

Population	No Website	Stage 1	Stage 2	Stage 3	Row Total
1 – 500	94.5%	3.7%	1.8%	0%	109
501-1,000	82.4%	10.6%	7.1%	0%	85
1,001 – 5,000	62.5%	12.5%	22.9%	2.1%	144
5,001 – 10,000	17.5%	12.5%	55%	15%	40
10,001 – 50,000	6.2%	3.1%	68.8%	21.9%	32
50,001 +	0%	0%	25%	75%	4
Total	272	37	86	19	<b>414</b>

Source: Author's Analysis of City Websites.

**Figure C: Stacked Graph of Website Sophistication by Population**



Source: Author's Analysis of City Websites

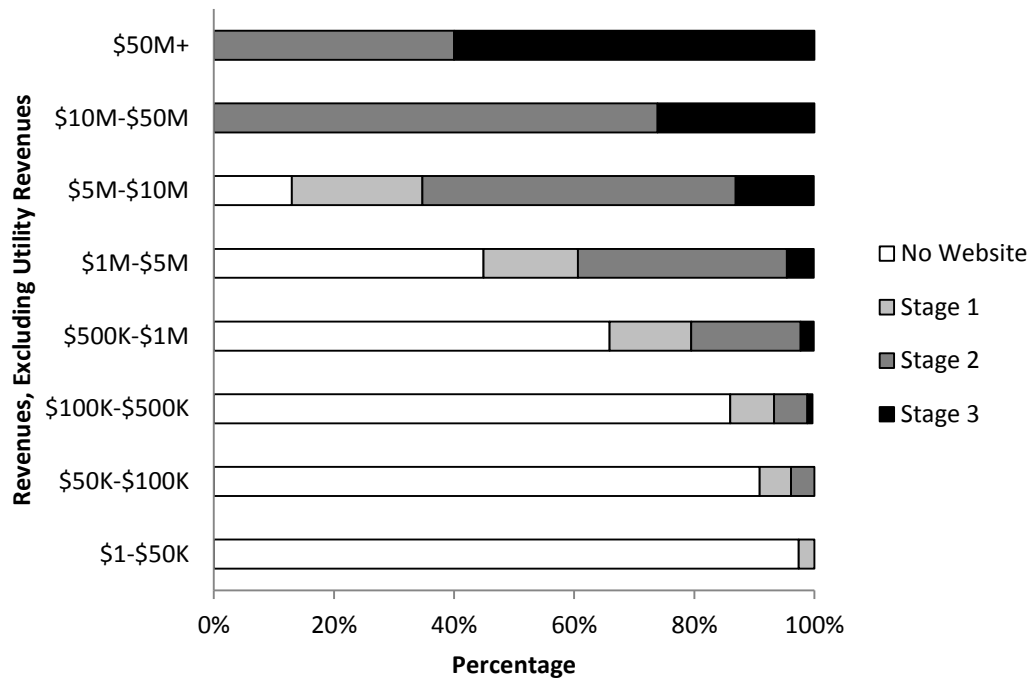
Table 6 presents e-government sophistication for cities within various revenue categories. Figure D presents this information in graphical form. It is clear from Table 5 and Figure C that cities with greater revenues, excluding utility revenues, have more sophisticated websites. This could be because cities with greater revenues have more money to spend on developing e-government services.

**TABLE 6: Cross-Tabulation of Website Sophistication by Revenues, Excluding Utility Revenues**

Revenues, Excluding Utility Revenues	No Website	Stage 1	Stage 2	Stage 3	Row Total
\$1 - \$50,000	97.4%	2.6%	0%	0%	39
\$50,001 - \$100,000	90.9%	5.2%	3.9%	0%	25
\$100,001 - \$500,000	86%	7.3%	5.5%	0.9%	109
\$500K - \$1M	65.9%	13.6%	18.2%	2.2%	44
\$1M - \$5M	44.9%	15.7%	34.8%	4.5%	89
\$5M - \$10M	13.0%	21.7%	52.2%	13.0%	23
\$10M - \$50M	0	0	73.9%	26.1%	23
\$50M +	0	0	40%	60%	5
<b>Total</b>	<b>225</b>	<b>36</b>	<b>78</b>	<b>18</b>	<b>357</b>

Source: Author's analysis of data obtained from the Kentucky League of Cities.

**Figure D: Stacked Graph of Website Sophistication by Revenues, Excluding Utility Revenues**



Source: Author's Analysis of City Websites.

To determine the effect the variables have upon the adoption of websites, holding all other variables constant, I conducted a multivariate regression analysis. Table 6 shows the output from this analysis. This test determines the impact that each of the variables has upon whether or not a city has a

website. The variables presenting statistically significant effects are the city manager and mayor-council forms of government, whether the city is the seat of its county, internet availability, median age, proportion of registered voters who are Democrats, and per capita revenue<sup>3</sup>. Because the presence of a website is represented by a binary dummy variable<sup>4</sup>, the coefficient listed for each variable can be thought of as a percent change in the likelihood of a city to have a website. For example, a city that is the county seat of its county is 14.2% more likely to have a website than a city that is not the county seat. Similarly a \$100 increase in per capita revenues makes a city 2.2% more likely to have a website.

**TABLE 6: Regression Results for Website Adoption by Kentucky Cities**

Variable	Coefficient	Robust Standard Error
City Manager**	0.456	0.105
Mayor**	0.232	0.052
Consolidated	-1.22	0.308
County Seat*	0.142	0.064
Percent 65+	0.045	0.432
Median Income <sup>1</sup>	0.002	0.002
Median Age*	-0.010	0.005
Home Ownership	0.121	0.189
Percent White	-0.273	0.184
College Degree	0.028	0.229
Percent English-only	-0.167	0.717
Internet Availability**	0.087	0.025
Voter Registration	-0.550	0.500
Percent Democrats*	-0.282	0.141
Per Capita Revenue <sup>2**</sup>	0.022	0.008
Population <sup>3</sup>	0.349	0.179
R-Squared	0.3199	
No. of observations	356	

\* - Significance at the 5% level; \*\* - Significance at the 1% level;

<sup>1</sup> - Median Income was analyzed in \$1,000s; <sup>2</sup> - Per capita revenue was analyzed in \$100s;

<sup>3</sup> - Population was analyzed in millions.

<sup>3</sup> Per capita revenue was added to the regression equation in place of city revenues. As discussed above, population and revenues are both related to cities adoption and sophistication of e-government services. Per capita revenue is used for the regression analyses, however, because of the high correlation between city population and city revenues.

<sup>4</sup> A binary dummy variable means that the 'website' variable can be either a 0, meaning the city does not have a website, or a 1, meaning that the city does have a website.

A similar multivariate regression analysis was performed to determine the effect of the demographic variables on website sophistication. Table 7 shows the output from this analysis. The variables with statistically significant effects are the city manager and mayor-council governance structures, median age, internet availability, percent of registered voters who are Democrats, per capita revenue, and population. The coefficients of this analysis cannot be interpreted as percent changes like the coefficients of the regression analysis for website adoption. The stage of sophistication is a categorical variable that ranges from 0 to 3. The coefficients for this analysis can be thought of as increases in stage of sophistication. For example, cities with the city manager type of governance are, on average, 1.4 stages of sophistication above cities with the commission government structure.

**TABLE 7: Regression Results for Website Sophistication by Kentucky Cities**

Variable	Coefficient	Robust Standard Error
City Manager**	1.410	0.238
Mayor**	0.515	0.095
Consolidated	-2.347	2.165
County Seat	0.230	0.121
Percent 65+	0.151	0.772
Median Income <sup>1</sup>	0.006	0.004
Median Age*	-0.021	0.009
Home Ownership	0.092	0.335
Percent White	-0.450	0.349
College Degree	0.068	0.364
Percent English-only	-0.584	1.266
Internet Availability**	0.195	0.045
Voter Registration	-0.943	0.873
Percent Democrats*	-0.540	0.235
Per Capita Revenue <sup>2*</sup>	0.031	0.013
Population <sup>3*</sup>	0.968	0.486

R-Squared 0.4107

No. of observations 356

\*-Significance at the 5% level; \*\*- Significance at the 1% level;

<sup>1</sup>-Median Income is analyzed in \$1,000s; <sup>2</sup>-Per capita revenue is analyzed in \$100s.

<sup>3</sup>-Population is analyzed in millions.

## Discussion

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The findings show that there are many cities in Kentucky that are using e-government to provide services to their citizens. Citizens of these cities have websites where they can at least access basic information about their local governments. The larger and wealthier communities are more likely to have sophisticated e-government websites which allow citizens to conduct financial and service transactions over the internet.

The findings also show that there are many cities in Kentucky that do not have a website. Less than 35% of cities currently have websites, leaving more than 65% of cities without online e-government services. Though whether or not these cities feasibly can or should implement e-government websites is beyond the scope of this analysis, we can assume that as time advances and web technologies become even cheaper to produce and maintain that more cities will adopt websites. Similarly cities with websites will likely develop new technologies to make their e-government services more sophisticated, providing enhanced abilities for citizens to connect and communicate with the city government online.

### *Economic Analysis of Significant Indicators*

According to fundamental economics, we would expect that cities with increased demand from their citizens for e-government services would be more likely to have websites. Some of the factors found to affect the adoption and sophistication of Kentucky city websites can be thought of as associated with demand for e-government. A city's population is a clear example: cities with 100,000 citizens will likely have much greater demand for city websites than cities with 1,000 citizens. Median age and internet availability likely affect the demand in that younger people with greater internet access are more likely to use the internet, and thus more likely to demand e-government than citizens who use the internet less often. Per capita revenue, on the other hand, is likely to affect the supply of e-

government services. Cities with more resources have greater ability to spend money on developing e-government services.

Mayor-council and city manager structures of city governance are likely indicators of higher adoption and sophistication because of the power centralized in the mayor or the city manager. In these forms of government, there is an authority figure that has a strong centralized decision-making role in leading the administration for the city. With this centralized power, the mayor or city manager likely has increased ability to implement a city website, especially compared to the public officials in the less centralized commission structure of governance.

The percent of registered voters who are Democrats as a negative indicator of city website adoption and sophistication, however, is more difficult to explain. Holding other variables constant through linear regression, there is no clear reason why cities with fewer Democrats are more likely to have websites. Previous research has shown that party affiliation can depend upon region so perhaps this indicates regional effects which are not accounted for elsewhere in the regression analysis. Another possibility is that cities with fewer Democrats are more likely to vote in a mayor or city manager with corporate business experience who would have experience implementing websites for e-commerce purposes. The correct reason why percent registered Democrats affects adoption and sophistication of city websites remains unknown.

#### *Potential Benefits of Increased Adoption and Sophistication*

Local governments across the country are struggling to provide services to their citizens while balancing their strained budgets. As one method of cost reduction, governments are “turning to online or electronic government service-delivery solutions to improve citizen access and [to] reduce costs” (Brown & Brudney, 96). It is widely accepted that e-commerce, online transactions between the public and businesses, has resulted in cost-savings to private firms (Borenstein & Saloner 2001). While e-

government has been slower to evolve, it is likely that governments can expect some degree of cost savings from replacing some of the paper-based face-to-face transactions with automated electronic exchanges. Arizona, for example, has seen substantial cost-savings through online vehicle registrations, with costs of just 2 cents per e-payment while the mail-based method previously cost 43 cents per check (Eggers 2004, 28, as cited by Blackstone, Boganno & Hakim 2005).

It is important for governments to understand that they will also likely achieve benefits for internal staff. With online transactions facilitated by e-government websites, city employees will likely experience increased efficiency, letting them be more productive with their time (Moulder 2002b). Forms that facilitate automatic online transactions for citizens will likely decrease the workload of reading, sorting and filing paper applications for staff. Because of these benefits of increased adoption and sophistication of city websites, state policymakers should consider ways to encourage cities to invest in online technologies. While grants for creating local government websites might not be feasible in the current budget situation there are alternative methods that state lawmakers could take to increase local e-government. The Commonwealth Office of Technology or perhaps the League of Cities could create a state-wide template that cities could easily customize to present important city information and to enable online communication with city officials at low cost.

#### *Direction for Future Research*

As we look towards understanding how governments have adopted e-government practices to better serve their citizens, we need to remember how expectations work. The better off a group becomes, the higher their expectations rise which only leads to them desiring more still (James 2007). As governments develop more and more sophisticated e-government practices that enhance the ease with which their citizens can conduct exchanges with their public officials, the citizens will experience increased expectations for more still. Continuous research into the new practices in e-government is

needed to research how governments are continuing to adopt the new technologies. Though it is beyond the scope of this project, I imagine that e-government will be continue to change over the next few years as social networking expands at an increasing rate. Social media has already become a major management issue as local governments struggle with how to interact with their citizens through websites like Facebook and Twitter (Bertot, Jaeger & Grimes 2010). The effectiveness of local government websites is another topic for future research. It is clear that e-government at the local level is something that many cities are using to reach their citizens, but any perceived gains in efficiency or effectiveness have not been tested.

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## **Appendix A: Methodology for Determining Website Stage**

*Stage One: one-way information exchange.* I classified a website as Stage One if it included any information related to city/county government, city/county events, or city/county services. Any reference at all to anything related to the municipal government or what the municipal government does I counted as Stage One sophistication.

*Stage Two: two-way information exchange.* To be classified as Stage Two, a website had to include either a web-based contact form or at least three linked email addresses of three different specific people within the government. The contact form must contain a field asking for the web user's contact information and must include a submit button that automatically emails the contained information to a municipal employee.

*Stage Three: transaction facilitation.* I classified a website as Stage Three if it had web-based applications that allowed web users to complete transactions online. Specifically I looked for any web-application accessible through the municipal's website where users could pay bills or taxes online, schedule appointments at government buildings, or perform similar transaction functions. The presence of a web application alone made the website a Stage Three, as I did not test to make sure the applications worked. A few websites had "Pay your utility bills online" webpages that said the pages were currently were being developed but were not currently operating. I did not count these websites as having Stage Three sophistication.

*Stage Four: vertical/horizontal integration.* I did not find any websites with Stage Four sophistication. To qualify for Stage Four a website must have had web-based applications where the web user could complete transactions with multiple municipalities: a true one-stop shop for online e-government provision.

*Stage Five: online political functioning.* Again, I did not find any websites with Stage Five sophistication. To qualify for Stage Five a website must have allowed online voting or online petitions.

In determining stage, I did not let lack of an early stage prevent me for looking for advanced stages. For example, if a website did not have Stage Two's two-way communication, I would have still counted Stage Four if I had observed horizontal integration to another municipality. That said, I did not see any instances where a municipality had an advanced stage when they were lacking an earlier one.

## Appendix B: Website Examples by Stage of Sophistication

### Stage 1: Flemingsburg City Website

The City of Flemingsburg's website provides a good example of Stage 1 sophistication. It provides basic information about the city government without providing any communication and transaction capabilities.

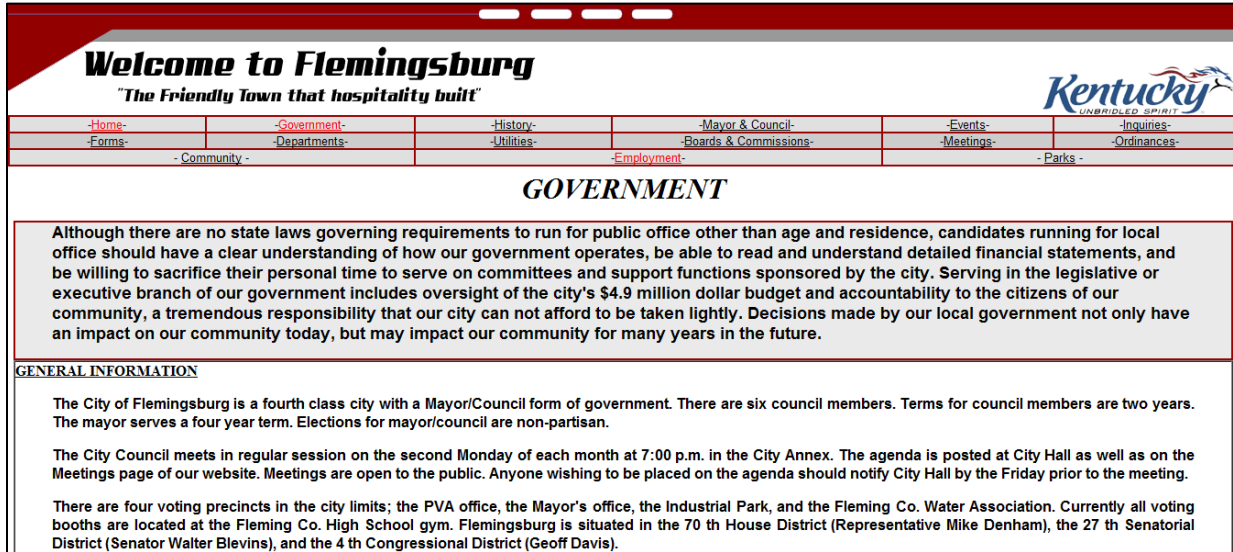


Figure 1. Screenshot from <http://www.flemingsburgky.org/>. Accessed 04/02/2011.

### Stage 2: Versailles City Website

The City of Versailles' website provides an online contact page that allows citizens to contact city officials online. This is a good example of Stage 2 sophistication.

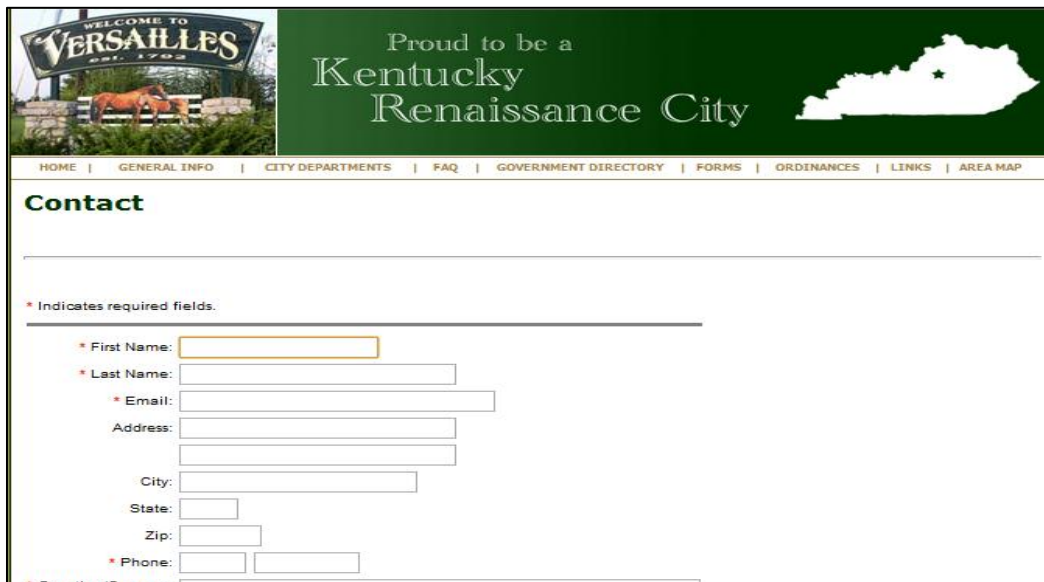


Figure 2. Screenshot from <http://www.versaillesky.com/>. Accessed 04/02/2011.

### Stage 3: Lexington-Fayette Urban County Government Website

The LFUCG website offers Stage 3 sophistication, affording citizens several opportunities to complete various service and financial transactions through the website. LexCall 3-1-1 Online, for example, allows residents to set up service requests online.

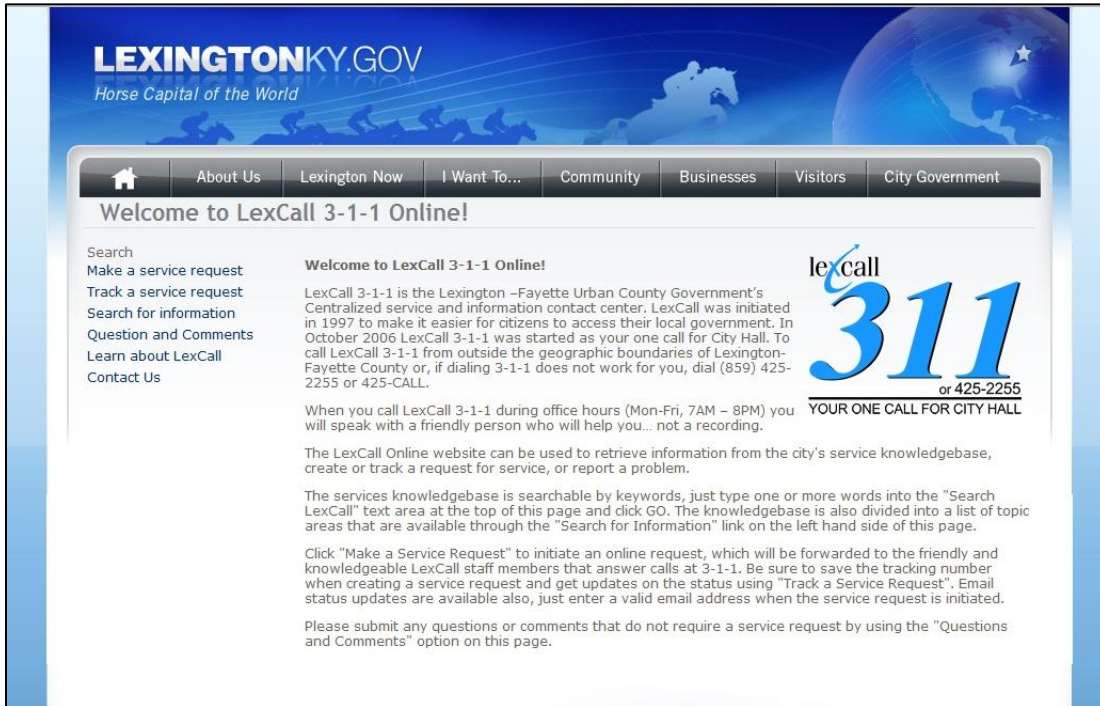


Figure 3. Screenshot from <http://www.lexingtonky.com/>. Accessed 04/02/2011.

## Appendix C: List of Cities with Websites Organized by Stage of Sophistication

### Stage 1

Adairville	Fulton	Owenton
Beattyville	Germantown	Park City
Beaver Dam	Glenview	Parkway Village
Bedford	Guthrie	Science Hill
Calvert City	Hanson	Scottsville
Campbellsburg	Hazard	Shepherdsville
Campbellsville	Hyden	Springfield
Carrolton	Leitchfield	Union
Cynthiana	Manchester	Warsaw
Earlington	Marion	West Liberty
Elsmere	New Haven	Williamsburg
Flemingsburg	Olive Hill	Woodland Hills

### Stage 2

Anchorage	Fort Mitchell	Murray
Audobon Park	Fort Thomas	Newport
Augusta	Franklin	Nicholasville
Bardstown	Georgetown	Oak Grove
Beechwood Village	Glasgow	Owensboro
Bellefonte	Goshen	Paducah
Benton	Grayson	Paintsville
Berea	Hazel	Park Hills
Bloomfield	Highland Heights	Pewee Valley
Brandenburg	Hillview	Princeton
Cadiz	Hodgenville	Russellville
Cloverport	Hopkinsville	Shelbyville
Columbia	Horse Cave	Smiths Grove
Corbin	Indian Hills	Somerset
Covington	Irvington	Stanford
Crescent Springs	Jeffersontown	Taylor Mill
Crestview	Kuttawa	Versailles
Crestview Hills	LaGrange	Villa Hills
Crossgate	Lakeside Park	Vine Grove
Dayton	Lebanon	Walton
Edgewood	London	West Point
Edmonton	Ludlow	Whitesburg
Elizabethtown	Madisonville	Wilder
Elkton	Mayfield	Williamstown
Eminence	Maysville	Wilmore
Erlanger	Midway	Winchester
Flatwoods	Morehead	
Florence	Middletown	

*Stage 3*

Alexandria  
Ashland  
Bellevue  
Bowling Green  
Danville  
Fort Wright  
Frankfort

Greensburg  
Henderson  
Independence  
Lawrenceburg  
Lewisport  
Lexington  
Livermore

Louisville  
Paris  
Pikeville  
Prospect  
Radcliff  
Richmond