

# GLOBAL CITIES ON THE WEB: AN EMPIRICAL TYPOLOGY OF MUNICIPAL WEBSITE

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## ABSTRACT

*Municipalities across the world are rapidly adopting e-government to improve public service delivery and provide one-stop government access to citizens. Using data from a sample of world cities, we describe the features of municipal websites and employ cluster analysis to create an empirical typology. Our results suggest that world cities can be classified into four types: 1) digitally mature cities, 2) digitally moderate cities, 3) digitally minimal cities, and 4) digitally marginal cities. This classification of cities largely reflects the social, political and economic context of countries and the resulting clusters exhibit closely similar shapes and differ considerably in level, indicating the trend of staged adoption of e-government among world cities. Moreover, the cities in the digitally mature and moderate clusters are associated with a higher GDP per capita, and percentage of Internet users, however they are not necessarily in the most democratic nations. Based on our overall findings, we suggest some hypotheses that derive from our typology and lines of future investigation for e-governance researchers.*

## INTRODUCTION

The study of e-governance has emerged as a major new area of research in public administration. The application of information technology in public administration has the potential to enable government to improve its performance by transforming the way in which interactions take place and allowing services to be delivered in new ways to citizens and businesses (UNDESA, 2003). This transformation promises to increase government accountability to citizens; provide greater public access to information; and create a more efficient, cost-effective government (Carter and Belanger, 2005). E-governance also may facilitate a transformation from a traditional bureaucratic paradigm—highlighted by standardization, departmentalization, and operational cost-efficiency—to a new e-government paradigm that emphasizes coordinated network building, external collaboration, and customer services (Ho, 2002). This transition may enable government agencies to improve the quality of service and significantly reduce costs, thereby resulting in more effective and efficient public service delivery (Dawes et al., 1999). The use of information technology also expands the possibilities for achieving direct democracy by focusing on transparency and openness. According to Garson (2004), e-governance in the United States promises three major developments: First, there will be a major transformation of the way in which the government conducts business. Second, new, improved, and transformed governmental processes will cut transaction costs, resulting in substantial government savings. Third, in the future, long-term loss of social capital in the U.S. will be reversed through increased electronic networking.

Some scholars have also researched the impact of e-governance adoption on internal organizational structures and processes, as well as on organizational outputs and outcomes. Proponents also consider the potential of e-governance adoption for e-

democracy and online citizen participation in an effort to decentralize decision-making. Information and communication technology tools can help citizen groups conduct research online, interlink with online communities, and host their own websites so as to post opinions (Bridges.org, 2002). E-governance also can facilitate effective public reporting by the government to ensure an informed citizenry. Thus, this phenomenon represents the intersection of multidisciplinary areas such as organizational theory, social science, informatics, computer science, public administration, business administration, economics, political science, law, and government (Lofstedt, 2005).

Many aspects of e-governance have been investigated by previous researchers in terms of the factors associated with its adoption, both in the U.S. and globally. According to Siau and Long (2006), income level, development status, and region were found to be the key factors that differentiate e-governance development across nations. In general, demand for e-governance is dependent on the growth in the number of Internet users in the society: "The extent to which e-governance develops ... is a function of the collective national and social capital supplying IT services and of informal social and human capital creating a demand for e-governance" (Rose, 2005: 1). McNeal et al. (2003) found states' e-governance performance in the United States to be strongly associated with political affiliation, legislative professionalism, and state professional networks but unrelated to state revenue per capita, income per capita, and education. McNeal et al.'s findings also suggested that urban residents tend to have better access to public services than rural residents.

At the municipal level, Moon's (2002) study found that cities with larger populations and council-manager forms of government tend to exhibit higher levels of e-governance technology adoption. Edmiston (2003) conducted a similar analysis of U.S. city and county e-governance using data from surveys conducted in 2000 by the National Association of Counties (NACO) and the ICMA. Edmiston found that most chief information officers believe that the e-governance sites already in place have not only helped improve service delivery, but have expanded access to government officials. In a later study on this same issue, Norris and Moon (2005) later identified orientation toward managerial innovativeness and city size as the most important determinants of e-governance adoption. Based on a 2005 study of New Jersey municipalities, Carrizales (2005) found that municipalities' e-governance status was largely influenced by the perception of their respective CAO (Chief Administrative Officer). Moreover, municipalities with advanced online practices tended to have an IT department and also allocate a greater percentage of their overall budget to IT functions.

Nonetheless, even though scholars agree on the potential of e-governance, little systematic information is known about the state of current e-governance practices worldwide. To better understand how various governments around the world differ in terms of e-governance, comprehensive global studies are needed as a basis for comparison. Even more important, such studies need to identify best practices and provide regional benchmarks for increased performance in e-governance over time for those parts of the world in more formative stages of technological and economic development.

The performance of e-governance has often been assessed by surveying administrators and technical staff in the organization. Studies by Reddick (2004) and Coursey and

Norris (2008) have utilized data from the International City/County Management Association (ICMA), which conduct surveys that are based on the responses of chief administrative officers of cities and counties. Research has long ignored the potential of websites to enhance government's efforts in providing services to its citizens. Government websites are an especially important component of e-governance because they represent the new interface between citizens and government. Many of the most important e-governance innovations involve web-based provision of government information and services to the public.

According to Pardo (2000), e-governance initiatives through a website vary depending on the primary focus of the respective governments, but they more commonly provide the following: (a) 24/7 access to government information and public meetings, (b) mechanisms that enable citizens to comply with state and federal rules on such formalities as drivers licenses or business licenses, (c) access to special benefits like welfare funds or pensions, (d) a network across various government agencies to enable collaborative approaches to serving citizens, and (e) various channels for digital democracy and citizen participation initiatives. Gant and Gant's (2002) significant study of the role of websites in electronic service delivery emphasized that such sites have the potential to integrate services and provide a higher quality of service to citizens. Governments should therefore "determine the best way to transform a basic website into a high-functioning Web portal" (1). Admittedly, when websites initially began to appear, they were "little more than dressed up search engines" (Gant and Gant, 2002: 2); since then, however, they have improved rapidly and incorporated multiple functions. As a result, today websites are a priority for governments investing in the digital delivery of services. Essentially, such sites are the new face of government and administrators are striving to ensure that the transformation to e-governance enhances the relationship between government and citizens. Yet only a few empirical studies have focused specifically on the actual features and functionality of government websites. Wilkinson and Cappel (2005), whose examination of county websites in Michigan focused on the effects of income and population on e-government use, determined that both economic prosperity and population were important influential factors. In general, highly populated and wealthier regions employed e-governance more effectively than others. Based on his research on counties across the United States, Huang (2007) found that website development is positively correlated with population size, population growth, racial diversity, income, employment opportunities, and education levels.

In this article, we attempt an empirical typology of government websites with a focus on world cities. In any new area of research, a typology or classification serves to describe and organize the phenomena of interest. In addition, a typology can generate hypotheses for future research. Using unique data on the e-governance of world cities, our empirical analysis identifies several basic types of municipal government websites, based on features and functionality. We then show that these types of websites reflect to some extent the political, social and economic context of countries. Finally, we suggest some hypotheses that derive from our typology and lines of future investigation for e-governance researchers.

## DATA AND METHODOLOGY

The data for our analysis come from an assessment of municipal websites worldwide conducted in 2005 and again in 2007 by the e-Governance Institute at Rutgers University and the Global e-Policy e-Government Institute at Sungkyunkwan University (Holzer and Kim, 2006; 2008).

The top 100 most wired nations (based on population with access to the Internet) were identified in 2007 using data from the International Telecommunication Union (ITU), an organization affiliated with the United Nations (UN) (Holzer and Kim, 2008). In each of these 100 countries, the largest city (by population) was selected for inclusion in the sample. In 2005, 81 of the 100 cities had official municipal websites, and these were assessed between August 2005 and November 2005. In 2007, 86 of the 100 cities had municipal websites, and these were assessed between August 2007 and December 2007.

The assessments were done by a multilingual team of trained raters who were recruited from public administration programs around the world. There were 92 raters in 2005 and 95 in 2007, and each rater received detailed written instructions on the use of the rating instrument as well as guidance from team leaders. To ensure inter-rater reliability, each municipal website was assessed initially by two raters, and in cases where significant variation (more than 10%) existed on the weighted score between raters, websites were analyzed a third time.

The assessment instrument contained 100 items representing five dimensions of government websites, listed below. To give a flavor for the content of each dimension, a few representative items are described (the complete instrument with all items is available in Holzer and Kim (2006; 2008). Appendix A presents an overview of the criteria.

1. *Security* (18 items, such as having a privacy/security statement, requiring registration for restricted information, authentication, encryption, data management, cookies etc.)
2. *Usability* (22 items, such as having a consistent navigation bar, site map, a search tool, User-friendly design, branding, length of homepage, targeted audience links or channels etc.)
3. *Content* (20 items, such as providing contact information for government offices, budget information, job openings, etc.)
4. *Service* (20 items, such as allowing citizens to pay utilities, taxes, fines, report crimes or violations, file complaints, etc.)
5. *Citizen participation* (20 items, such as allowing citizens to provide feedback, subscribe to a newsletter, post to an online bulletin board or discussion, etc.)

The items, which include a mix of dichotomous (0-1) and Likert-type (0-3) items, are added to form a total score for each dimension. The descriptive statistics are provided in Table 1.

**Table 1: Descriptive Statistics**

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	<b>N</b>	<b>Min.</b>	<b>Max.</b>	<b>Mean</b>	<b>SD</b>
<b>2007</b>					
Privacy	86	0.00	17.60	4.49	4.98
Usability	86	2.82	18.75	11.95	3.02
Content	86	0.40	18.80	7.58	3.91
Service	86	0.17	19.83	5.80	4.04
Participation	86	0.00	16.18	3.55	3.18
<b>2005</b>					
Privacy	81	0.00	17.60	4.17	5.24
Usability	81	4.06	19.06	12.42	3.34
Content	81	0.42	16.04	7.63	4.02
Service	81	0.00	16.61	5.32	3.73
Participation	81	0.00	13.64	3.57	3.17

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## **RESULTS AND ANALYSIS**

We begin this section with a basic descriptive analysis of the aggregate scores and ranks for the sampled cities, using the five dimensions of e-governance described above. Next, we use these five dimensions to perform a cluster analysis and thus group the cities into an empirical typology.

### **Descriptive Analysis**

Our descriptive results suggest that municipalities around the world are gradually adopting e-governance and providing advanced facilities on their official websites. The average overall score for all municipalities was 33.37, an increase from 33.11 in 2005. The average score for municipalities belonging to OECD countries was 45.0, while the average of municipalities in non-OECD countries was 27.46. The number of cities in OECD countries with scores above average was 20 (of 29), while only 16 of 57 cities in non-OECD countries were above that average. Our study also found that the number of cities with official websites has increased to 86%, compared to 81% in 2005. Among the cities selected, 50% of those in Africa have established official city websites, which represents a significant increase from 29% of the cities in 2005. In Asia, about 89% of all cities selected have established websites, an increase from 78% in 2005. While 70% of the cities in North America have established official city websites, every city selected in Europe, South America, and Oceania have their own official websites. These findings reflect the fact that cities around the world, especially the non-OECD cities, are becoming more involved in offering government services online.

Seoul, Hong Kong, Helsinki, Singapore, and Madrid represent cities with the highest e-governance scores. Noticeable changes were seen in the top five cities, in comparison to the 2005 study. Seoul remained the highest ranked city, and the gap between the first and second positions increased slightly since 2005. Seoul recorded a score of 87.74, the

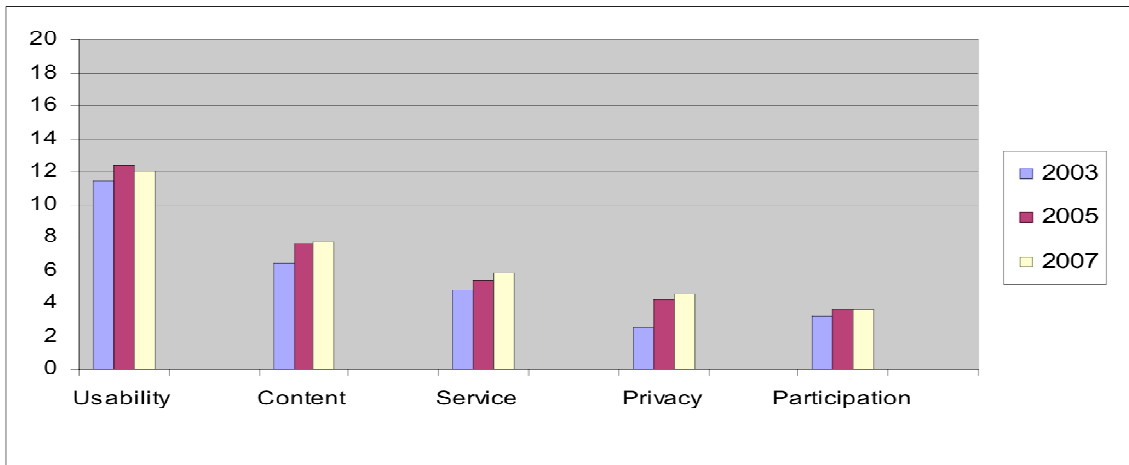
highest ranked city website for 2007. Seoul's website was also ranked highest in 2005, with a score of 81.70. In second place, Hong Kong had a score of 71.24, while it was ranked fourth in 2005 with a score of 61.51. Helsinki, Finland improved its ranking from 35<sup>th</sup> in 2005 to 3<sup>rd</sup>, with a score of 71.01 in 2007. Singapore and Madrid were among the top five ranked municipal websites, with scores of 68.56 and 67.98, respectively. Singapore was ranked 6<sup>th</sup> in 2005, while Madrid significantly increased its ranking from 54<sup>th</sup> in 2005 to the 5<sup>th</sup> position in 2007. Table 2 lists the top 20 ranked municipalities, along with their overall scores.

**Table 2: Top 20 Cities in Digital Governance (2007)**

Ranking	City	Score	Privacy	Usability	Content	Service	Participation
1	Seoul	87.74	17.60	18.13	16.00	19.83	16.18
2	Hong Kong	71.24	12.40	16.35	18.80	19.83	3.86
3	Helsinki	71.01	15.60	17.82	14.60	11.36	11.64
4	Singapore	68.56	14.00	16.57	12.20	12.88	12.91
5	Madrid	67.98	12.80	18.75	16.40	14.58	5.45
6	London	65.79	15.60	18.75	12.80	13.73	4.91
7	Tokyo	59.89	14.41	13.44	13.40	11.02	7.64
8	Bangkok	59.01	11.20	11.88	14.80	9.49	11.64
9	New York	56.54	11.60	14.69	13.20	10.51	6.54
10	Vienna	53.99	10.40	15.00	10.20	9.66	8.73
11	Dublin	53.38	9.60	14.69	13.60	9.49	6.00
12	Toronto	51.99	5.60	16.25	12.60	11.36	6.18
13	Berlin	51.36	11.20	14.69	11.20	8.81	5.46
14	Zurich	51.02	7.20	15.63	12.00	9.83	6.36
15	Prague	50.34	9.60	14.69	12.60	10.00	3.46
16	Buenos Aires	49.89	4.00	17.19	14.80	11.36	2.55
17	Bratislava	49.82	11.20	13.13	10.40	7.46	7.64
18	Sydney	48.60	9.60	15.63	9.00	9.83	4.55
19	Amsterdam	47.72	10.00	11.56	10.80	6.27	9.09
20	Rome	46.98	10.00	11.25	9.60	10.68	5.45

Among the five categories, the most significant improvement in average scores occurred in the services category (from 5.32 in 2005 to 5.8 in 2007). The highest average score occurred in the usability category (11.95), and the lowest average score was in the citizen participation category (3.55) in 2007. The performance of cities in privacy/security, along with services, has continued to increase among global municipalities. Only 26 cities evaluated scored 0 on privacy, compared to 31 in 2005. As in the 2005 findings, citizen participation had the lowest scores among the five categories, implying that cities have yet to recognize the importance of enabling and supporting citizen participation online (Figure 1).

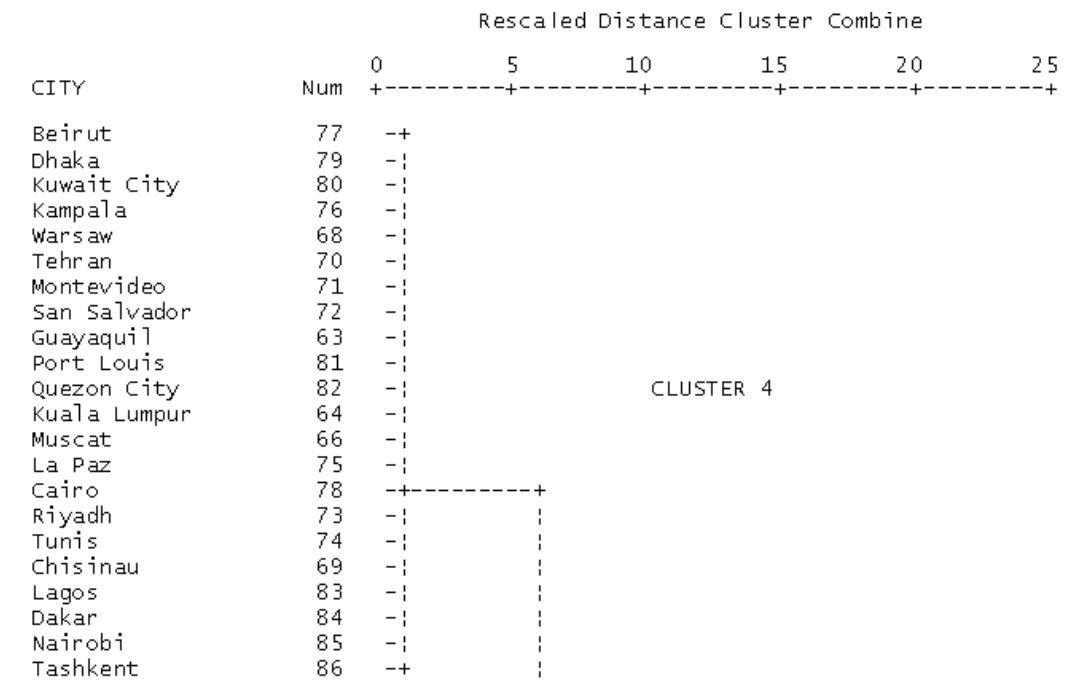
**Figure 1: Average Score by Categories 2003 - 2007**



### Cluster Analysis

Using scores on the five dimensions, we ran a hierarchical cluster analysis, standardizing the variables (with a z-score transformation) and using Euclidean distances with Ward's method of clustering (Aldenderfer and Blashfield, 1984). Cluster analysis uses the information in the variables (the scores on the five dimensions) to group cases (the world cities) into relatively homogenous clusters. The results of the cluster analysis are presented in Figures 2 and 3 in the form of dendograms, a graphical means of presenting the hierarchical clustering.

**FIGURE 2: Dendogram from cluster analysis of 2007 scores**

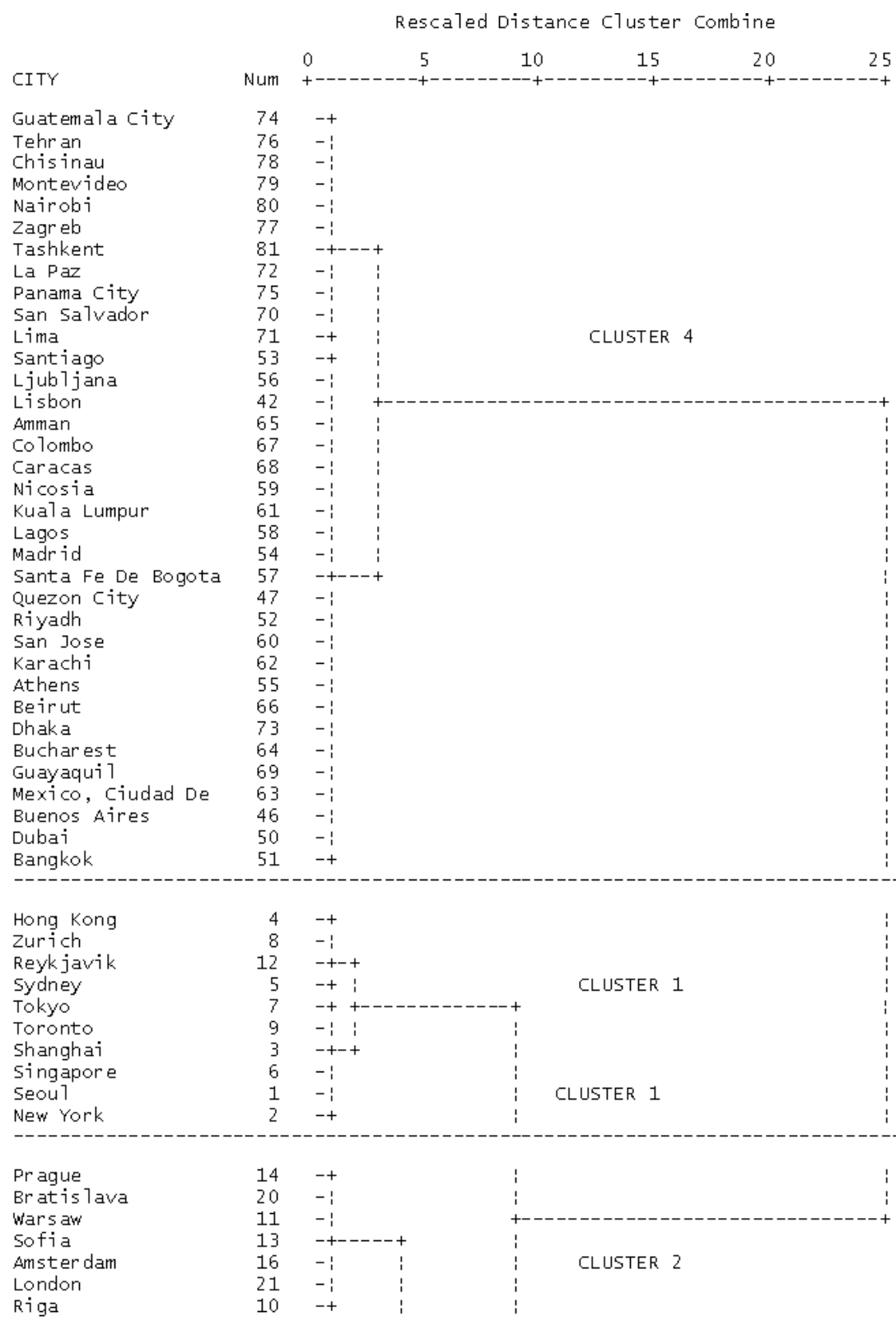


Almaty	28	--		
Dubai	30	-		
Mumbai	32	-		
Lima	35	---+		
Jerusalem	36	-		
Bucharest	37	-		
Brussels	38	-		
Ho Chi Minh	26	-		
Istanbul	31	-		
Luxembourg City	44	--		
Riga	24	--		
Moscow	25	---+		
Zagreb	34	-		
Cape Town	39	-		
Belgrade	33	-		
Kyiv(kiev)	43	-		
Paris	29	-		CLUSTER 3
Vilnius	40	-		
Caracas	41	--		
Copenhagen	42	--		
Jakarta	45	-		
Oslo	50	-		
Lisbon	51	-		
San José	60	-		
Minsk	47	---+		
Sarajevo	55	-		
Amman	65	-		
Karachi	59	-		
Casablanca	61	-		
Budapest	67	-		
San Juan	53	-		
Stockholm	58	-		CLUSTER 3
Tallinn	57	-		
Athens	52	-		
Ljubljana	56	-		
Santiago	46	-		
Sao Paulo	54	-		
Santa Fé De Bogotá	48	-		
Lefkosia(Nicosia)	49	-		
Guatemala City	62	--		
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Rome	20	--		
Shanghai	23	-		
Bratislava	17	-		
Auckland	21	-		
Amsterdam	19	-		
Vienna	10	-		
Sofia	22	---+		CLUSTER 2
Toronto	12	-		
Zurich	14	-		
New York	9	-		
Dublin	11	-		
Berlin	13	-		
Prague	15	-		
Sydney	18	-		
4 Buenos Aires	16	-		
4 Mexico City	27	--		
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4 Madrid	5	--		
London	6	---+		
Hong Kong	2	--		
3 Helsinki	3	--		CLUSTER 1
Singapore	4	-		
Tokyo	7	---+		
4 Bangkok	8	-		
Seoul	1	--		

NOTE: Cluster analysis based on Ward's method, squared Euclidean distances, and standardized variables. Cities which rose two or more levels since 2005 are indicated with a number representing their cluster level in 2005.



**FIGURE 3: Dendrogram from cluster analysis of 2005 scores**



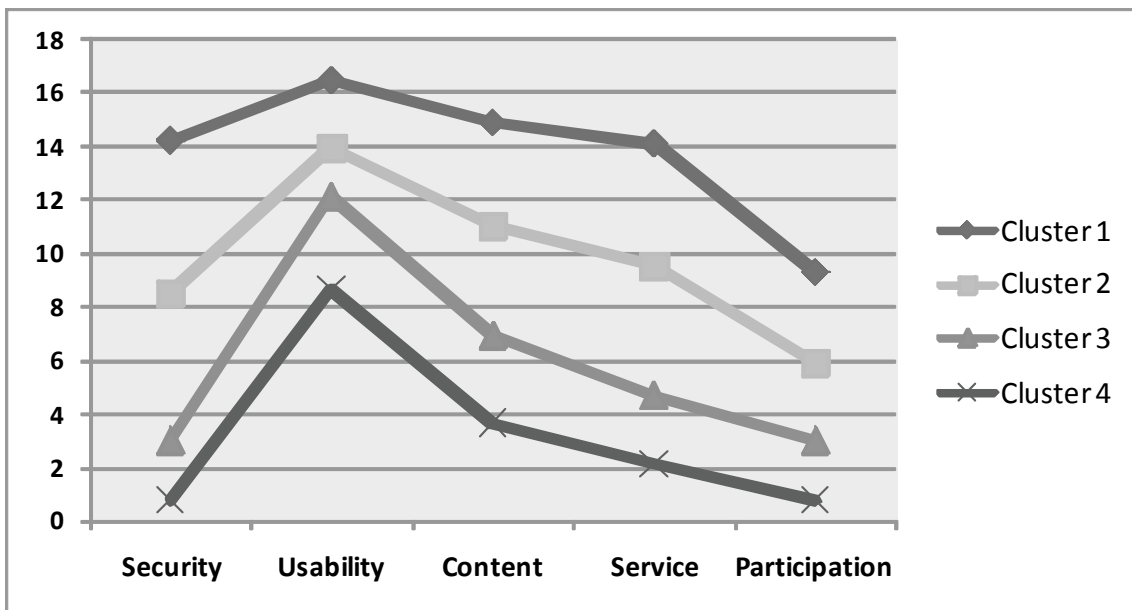
Vienna	37	--		
Mumbai	48	-		
Paris	17	-		
Dublin	19	---+ +	-----+ +	-----+ +
Luxembourg city	15	-		
Ho Chi Minh	27	-		
Auckland	30	-		
Rome	22	-		
Copenhagen	24	-		
Macao	18	-		
Istanbul	25	-	++	
Berlin	23	++		
Jakarta	39	++		
Tegucigalpa	40	-		
Cairo	45	---+ +		
Belgrade	44	-		
Minsk	49	-		
Jerusalem	38	-		
Kiev	41	++ ++		
Cape Town	31	++		
Brussels	34	-		
Vilnius	43	-		
Tallinn	26	-		
Oslo	29	+++		
Sao Paulo	33	-		
Stockholm	32	-		
Helsinki	35	-		
Moscow	36	-		
Budapest	28	--		

CLUSTER 3

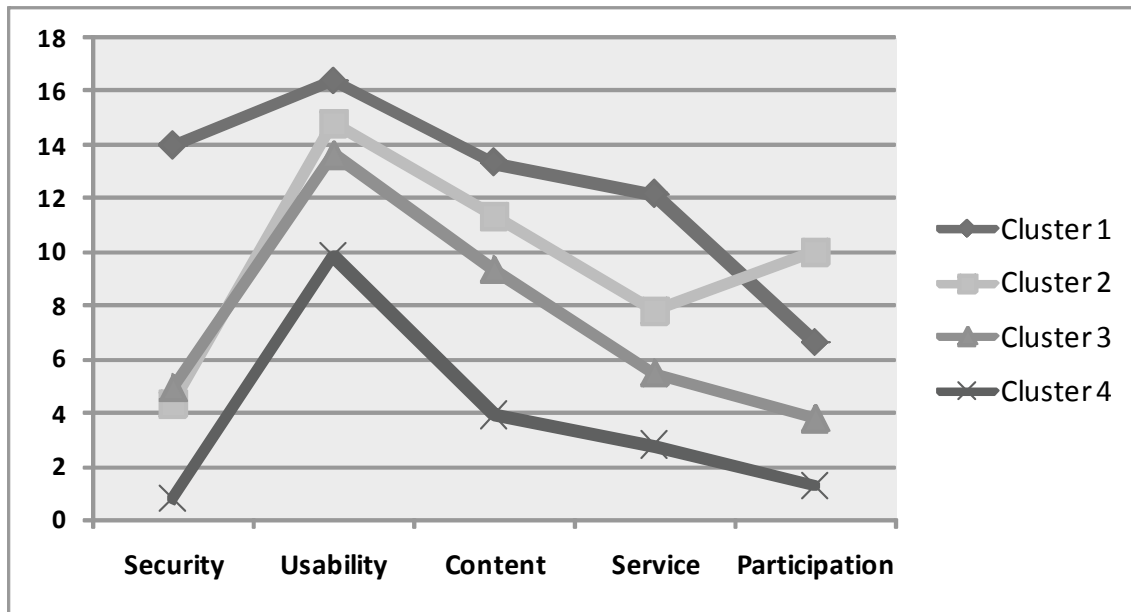
NOTE: Cluster analysis based on Ward's method, squared Euclidean distances, and standardized variables.

Based on inspection of the dendograms, a four-cluster solution was selected as most meaningful. Figures 4 and 5 show the profiles of each cluster based on the means of the five website dimensions.

Figure 4: Cluster Profiles (2007)



**Figure 5: Cluster Profiles (2005)**



The cluster analysis of the results suggests that the world city websites fall into a fairly interpretable typology, which is largely one of differences in level rather than differences in shape. Indeed, the shapes of the profiles of each cluster appear to be remarkably similar, with the highest means for usability and the lowest means for service and citizen participation. Thus, we can interpret and label the four clusters as follows: 1) *digitally mature cities*, 2) *digitally moderate cities*, 3) *digitally minimal cities*, and 4) *digitally marginal cities*. To get a more detailed perspective on the cities in these clusters, we interpret them further in the context of several standard governance, economic development, and technology indicators for countries: Corruption Perception Index (TI, 2008), Democracy Index (EIU, 2008), gross domestic product (GDP) (UNDESA, 2008), and percentage of Internet users in the population (ITU, 2007). Table 3 presents the means of these indicators for each of the four clusters.

**Table 3: Comparison of Clusters**

Cluster	Corruption Perception Index	Democracy Index	GDP per capita	Percent Internet users
1	7.1	7.6	30,916	61.5
2	6.5	8.0	31,362	53.9
3	4.8	6.7	18,470	35.4
4	3.5	4.9	5,922	18.2

The digitally mature cities have an overall average score of 68.90, and high scores in terms of corruption perception index and percentage of Internet users. The cities in this category, all from Asia and Europe, are Seoul, Hong Kong, Helsinki, Singapore,

Madrid, London, Tokyo, and Bangkok. The cities are also advanced in all five categories and, most importantly, they had an average score of 9.28 in the citizen participation category. This is significantly above the average score for all cities and can be explained by the high percentage of Internet users in the corresponding nations. Seoul was ranked highest among the digitally mature cities, followed by Hong Kong and Helsinki. The number of cities that were digitally mature decreased from 10 in 2005, to 8 in 2007, and Madrid, Helsinki, and Bangkok were new to this cluster. Madrid and Bangkok moved up from the fourth cluster in 2005, while Helsinki upgraded from the third cluster. Compared to the digitally mature cities in 2007, cities that were in the same category had the highest average scores in all categories in 2005 except in citizen participation.

The digitally moderate cluster consisted of 16 cities, with an average overall score of 48.80. The highest ranked city in this category was New York, with a score of 56.54 points, while the lowest ranked city was Mexico City, with an overall score of 38.75. The cities that were moderately mature belonged to all continents, except Africa. They lagged behind the mature cities in the five categories, as well as in the corruption perception index and the percentage of Internet users. Nevertheless, the digitally moderate cities scored high in terms of the democracy index and in gross domestic product.

The digitally minimal cluster was the largest, consisting of 40 cities (ranging from Riga, 39.74, to Budapest, 19.03). About half of all cities belonged to Europe, which was followed closely by cities in Asia. In this category, on average, only about 35% of the population seemed to be online. Finally, 22 cities belonged to the cluster of digitally marginal cities (ranging from Guayaquil, 20.81, to Tashkent, 3.73, with an average score of 15.9). These cities also had considerably low ranks, in terms of GDP and percentage of Internet users.

## **DISCUSSION AND IMPLICATIONS**

Nations and cities are creating smart communities by using the new technologies for improving their standards of living, and providing efficient and effective services. Responding to an increasingly online society, governments are aiming to improve the quality of life for their citizens by "...disseminating knowledge, strengthening social cohesion, generating earnings, and finally, ensuring that organizations and public bodies remain competitive in the global electronic marketplace" (Lambrinouidakis, et al., 2003: 1). Cities are gradually becoming venues of innovation and opportunity, by adopting new technologies that are leading them to become the 'digital cities' of the world. The 'digital cities' are enabling more interactions between physical and virtual environments to expose their users to the best of both worlds (Craglia, 2004).

Our results indicate that world cities fall into types that largely reflect the level of e-governance sophistication: digitally mature, digitally moderate, digitally minimal, and digitally marginal cities. The digitally mature cities are distinctly high performing in all five categories; however, some cities have not repeated their performance over the two years investigated, and have tended to drop into the other clusters. In 2005, the digitally mature cluster consisted of 10 cities, which decreased to 8 cities in 2007. Major cities, such as New York, Shanghai, Toronto, Sydney, and Zurich shifted to the digitally

moderate cluster in 2007, while Madrid and Bangkok improved their rankings from the digitally marginal cluster, in 2005, to the digitally mature cluster in 2007. This trend seems to reiterate previous findings reported in the e-government literature where early adopters of technology do not necessarily repeat their performances in subsequent years, and late adopters increase their performance based on lessons learned from the early adopters.

As noted, an interesting aspect of these findings is that the resulting typology is largely one of different levels rather than different shapes, suggesting the phenomenon of staged growth in e-government adoption among world cities. Many scholars have adopted an evolutionary approach to the study of e-government, one that views growth in terms of various stages (from developing a webpage, to having fully integrated online services that encompasses all parts of society). Each stage offers higher levels of technical sophistication and, ultimately, will lead to the development of a “one-stop government” for citizens, where all public agencies are inter-connected, so that citizens may be able to access services from any public agency at a single location. The clusters of cities seem to follow consistent trends across the five categories, for the two years studied. Compared to 2005, four clusters had increased overall scores in 2007, as did individual categories, except for a few minor trends, such as the digitally marginal cities showing decreased usability, and cities in the digitally moderate, minimal, and marginal clusters showing decreased citizen participation.

Another implication of the research is the relation of socio-economic factors to the adoption of e-government among global cities. The digitally mature and moderate clusters are associated with a higher democracy index, GDP per capita, and percentage of Internet users, compared to the other clusters. Nevertheless, the digitally mature cities were ranked lower than the digitally moderate cities on the democracy scale, even though their websites provide advanced citizen participation features. The Internet is a convenient mechanism through which government can conduct online citizen-participation exercises and have the potential to decentralize decision-making. Many scholars and practitioners of e-government have expressed confidence in its potential for e-democracy and for enhancing the degree and quality of public participation in government. According to Coleman and Gotze (2001: 1), the introduction of information and communication technology “offer a possibility of a new environment for public communication which is interactive, relatively cheap to enter, unconstrained by time or distance,” thus having the potential to reinvigorate public participation in civic affairs, especially in developed democracies. The authors also note that the e-government orientation in developed democracies tends to be toward online services to attain greater efficiency, rather than online citizen participation and no link seems to exist between e-government and e-democracy. Our findings reiterate this notion, since the digitally mature cities are not necessarily in the most democratic nations.

Finally, our findings provide significant implications for a digital divide that exists around the world. In general, the digital divide refers to the gap between those who have access to ICTs and those who do not. Digital inequality has a major effect on citizen participation and on trust in government. When governments make decisions, information must reach all parts of the population. Many scholars; however, have different perspectives about the digital divide. Gorla (2008) considers the digital divide to be a consequence of the inequitable distribution of technology, compounded by

poverty, illiteracy, and other social problems. Jones (2003) proposes the following dimensions: social divide between the information-rich and the information-poor; global divide between developed and developing nations; and democratic divide between those who use the Internet for civic participation and those who do not. Jones concludes that such divides depend on three unique aspects: “access to information and communication technologies, access to appropriate content, and geopolitical aspects” (138). Jan van Dijk (2005) views the digital divide as a social and political problem, not as a technological one. He stated that rather than a simple division, a ‘tripariate’ division occurs in society, in terms of the access to information technology. Our findings with regards to the four different clusters support this view in that different levels of the divide exist among various cities, rather than just a simple division. This re-emphasizes the need for incremental steps to be taken to bridge such divides.

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## APPENDIX A. SURVEY FRAMEWORK

Privacy/ Security	
1-2. A privacy or security statement/policy	13. Use of "cookies" or "Web Beacons"
3-6. Data collection	14. Notification of privacy policy
7. Option to have personal information used	15. Contact or e-mail address for inquiries
8. Third party disclosures	16. Public information through a restricted area
9. Ability to review personal data records	17. Access to nonpublic information for employees
10. Managerial measures	18. Use of digital signatures
11. Use of encryption	
12. Secure server	
Usability	
19-20. Homepage, page length.	25-27. Font Color
21. Targeted audience	30-31. Forms
22-23. Navigation Bar	32-37. Search tool
24. Site map	38. Update of website
Content	



<p>39. Information about the location of offices</p> <p>40. Listing of external links</p> <p>41. Contact information</p> <p>42. Minutes of public</p> <p>43. State code and regulations</p> <p>44. State charter and policy priority</p> <p>45. Mission statements</p> <p>46. Budget information</p> <p>47-48. Documents, reports, or books</p>	<p>49. GIS capabilities</p> <p>50. Emergency management or alert mechanism</p> <p>51-52. Disability access</p> <p>53. Wireless technology</p> <p>54. Access in more than one language</p> <p>55-56. Human resources information</p> <p>57. Calendar of events</p> <p>58. Downloadable documents</p>
Service	
<p>59-61. Pay utilities, taxes, fines</p> <p>62. Apply for permits</p> <p>63. Online tracking system</p> <p>64-65. Apply for licenses</p> <p>66. E-procurement</p> <p>67. Property assessments</p> <p>68. Searchable databases</p> <p>69. Complaints</p> <p>70-71. Bulletin board on civil applications</p>	<p>72. FAQ</p> <p>73. Request information</p> <p>74. Customize the main state homepage</p> <p>75. Access private information online</p> <p>76. Purchase tickets</p> <p>77. Webmaster response</p> <p>78. Report violations of administrative laws and regulations</p>
Citizen Participation	
<p>79-80. Comments or feedback</p> <p>81-83. Newsletter</p> <p>84. Online bulletin board or chat capabilities</p> <p>85-87. Online discussion forum on policy issues</p> <p>88-89. Scheduled e-meetings for discussion</p>	<p>90-91. Online survey/ polls</p> <p>92. Synchronous video</p> <p>93-94. Citizen satisfaction survey</p> <p>95. Online decision-making</p> <p>96-98. Performance measures, standards, or benchmarks</p>

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