

## Global comparative municipal e-governance: factors and trends

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### ABSTRACT

This paper compares municipal e-governance performance on a global basis. The study utilizes data from a 2013 e-governance survey of the world's largest municipalities that evaluated the performance of their official websites in five distinct categories: privacy/security, usability, content, services, and citizen participation. A cluster analysis was then used to classify the cities into four different groupings: digitally mature cities, digitally moderate cities, digitally minimal cities, and digitally marginal cities. Grouping by cluster made it possible to identify e-governance trends among the municipalities. In addition, a path analysis found that Internet usage significantly impacted a city's e-governance performance, along with the mitigating influences of education and economic status. The longitudinal findings are consistent with previous innovation diffusion research that suggests website performance and global e-governance are following a logistical or s-shaped curve. Finally, important recommendations for practitioners and future lines of e-governance research are suggested.

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## Introduction

Over the past decade, all levels of government around the world have increasingly adopted information and communication technology (ICT) tools. The use of ICTs, and the resulting rise of e-government, has the potential to transform government and public administration.

Ideally, transparency, accountability, service delivery, public participation, and trust in government, will be improved through applied technology. Already, e-government has been recognized as an important instrument for sustainable development, economic development, and social inclusion (United Nations, 2014). Furthermore, the potential for e-government is only enhanced by the latest technology trends, including social media, mobile government, civic apps, big data, and smart cities initiatives.

As governments become increasingly interconnected, it is also important to understand how various regions across the world adopt and implement e-governance. To do this, a

global comparative perspective is necessary. Accordingly, this paper captures this worldwide phenomenon by examining the official websites of the largest municipalities from across the world. Using their respective native languages, website performance was analyzed across five essential components of e-governance: privacy and security, usability, content, services, and citizen and social engagement.

The paper begins with a literature review on the implications of e-governance with an emphasis on the comparative approach to study e-governance trends. The methodology section discusses features from the above five categories in the Rutgers E-governance Institute's e-governance index, followed by a description of recent trends in global municipal e-governance. The paper discusses the results of a cluster analysis of the evaluated cities and a path analysis of the factors influencing e-governance globally, along with practical recommendations and suggestions for future e-governance research.

## Literature review

E-government is complex, varied, and may be used uniquely within its intended domain; however, at its simplest, e-government is a digitally interactive government. Our review of the literature presents the various definitions related to e-government, the theories behind the development pathways for e-government and addresses the key functions of e-government, including: performance improvement, service delivery, government-to-citizen (G2C) communication, and citizen participation.

In the early 2000s, e-government was seen as not much more than the use of ICTs to make internal and external functions more efficient and effective (UNDESA, 2003) and to improve governing capacities (OECD, 2003). As e-government matured, digital technologies were gradually used to focus on citizen participation and e-democracy, facilitating the transformation of e-government to e-governance. Over time, the terms, "e-government" and "e-governance," were often used interchangeably without a clear understanding of how, or if, they differed (Flak et al., 2007; Saxena, 2005; Von Haldenwang, 2004). Scholars and researchers have sought to reach a consensus on the meanings and definitions of these terms.

Many e-government scholars use the term "e-government" to broadly encompass most information technology (IT) innovations in the public sector (Brown, 2007; Kim 2007; Lindblad-Gidlund 2008). Some prefer the term "e-governance," to emphasize the importance of citizen participation (Bannister 2007, Das, DiRienzo, & Burbridge, 2009). Others have chosen to differentiate e-government and e-governance (Calista & Melitski, 2007) by suggesting that e-government relates to online transactions and services, while e-governance relates to online policy discourse and citizen participation in government.

Despite these definitional challenges, most e-government and e-governance research allows for the possibility of a direct democracy through trust and transparency.

While e-government may be a relatively recent phenomenon, public organizations have a long history of adopting and implementing technologies. For example, mechanical computing technologies were used in the 1890s to assist with the U.S. Census (Davis et al., 1990). By World War II, the Anistoff-Berry Computer (ABC) was modified and the Electronic Numerical Integrator Analyzer and Computer (ENIAC) prepared firing tables for artillery (Melitski, 2006). Public organizations were at the forefront of developing and using networking and communication technologies through the U.S. Department of Defense's Advanced Research Projects Agency's ARPANET (Spinello, 2002).

As hardware, software, and networking evolved, the new technologies required integrated development, and the fields of information technology and information sciences emerged. The theoretical pathways that led to the development of e-governance are also a matter of some disagreement.

Fortunately, Garson (2006) provides a four-fold theoretical typology for the integrated development of information technologies in the public sector involving technological determinism, systems theory, socio-technical and reinforcement theory. Continuing that work, e-government scholars have suggested examples of Garson's theoretical typology in order to better describe how ICTs followed a maturational progression involving increasing levels of technological sophistication (Layne & Lee, 2001; Moon, 2002; Norris & Moon, 2005).

The first theory, technological determinism, posits that new technologies drive innovation in e-governance. Private sector technologies that were adopted into e-governance systems such as e-commerce and GIS systems are ready examples of technological determinism.

From the systems theory perspective, institutional interests seeking to solve complex organizational challenges drive innovation. This has provided a rationale for governments to offer e-government services that increase transparency and make static information more easily available to citizens.

The socio-technical approach views technology as a means to improve societal conditions. In some cases, e-government technology advanced and surpassed other technology and communication tools, and broke down institutional barriers, engaged citizens, and fostered online participation in government.

Finally, reinforcement theory posits that technology is developed to uphold the status-quo of existing socio-political forces (Melitski & Calista, 2016). For example, the earliest e-government developments merely cataloged existing information online and mirrored the existing political and organizational structures

Though the theoretical pathways are many, ICTs and social media have gradually morphed into appropriate tools for communicating with citizens. This can encourage the public to participate meaningfully in e-government. Once the public is in a better position to oversee the government's agenda and contribute to decision-making, then trust in government and public officials will increase (Gore, 1993; West, 2004). This has always been the promise of e-governance from its earliest days.

However, before social media and Web 2.0 applications, researchers were often critical of e-government and e-governance initiatives for failing to live up to their respective potentials to transform citizen engagement (Coursey & Norris, 2008; Lee et al., 2011). With the emergence of social media, open government, and Web 2.0 technologies, interested researchers and practitioners have shifted to these new innovations to engage citizens directly (Manoharan, 2013; Reddick & Aikens, 2012). These innovations further extend the potential of e-government to improve public perception and trust of government through better communication between citizens and government agencies (West, 2004).

Through e-government, interactions, both within a government (intra-governmental) and between governments (inter-governmental), can be improved, and increased communication can lead to increased responsiveness. As numerous policymakers and lawmakers have recognized, e-government provides a promising mechanism for a more responsive government (Bwalya, 2009). In this sense, e-governance can be seen as another means of professional governance practice. In which case, such a practice must also be equitable,

responsive, and accountable in order to make good decisions and to provide its citizens with quality leadership (Lau, 2007).

Most observers agree that e-government can provide multiple benefits ranging from improving government performance, responsiveness, and integrating government services to increasing transparency, accountability and trust in government through providing innovative opportunities for citizen participation online. At its best, e-government is not simply a digitized version of traditional government; rather, its advocates assert that technology can significantly improve the government, as well as revolutionize the interactions between citizens and governments and the very nature of politics (Dada, 2006).

With governments becoming increasingly interconnected, understanding how various regions across the world use e-governance, and how that use differs, is important. Therefore a global comparative assessment is necessary, and accordingly, this paper captures this worldwide phenomenon by examining the official websites of large municipalities across the world and analyzes their e-governance trends on a longitudinal basis. Additionally, this paper identifies both the factors associated with higher e-governance performance and the best practices in e-governance worldwide.

## Design and methodology

This study analyzed the websites of the most populous municipalities in the world in order to understand the status of e-governance in their respective nations. First, the top 100 wired nations were identified by their number of Internet users using data from the International Telecommunication Union (ITU). The largest city (by population) was selected from each of these 100 nations, and was considered as a surrogate for all cities and regions in that country. This sampling technique has been used by the E-governance Institute at Rutgers University since 2003 to conduct the international survey of municipalities (Calista, Melitski, Holzer & Manoharan, 2010; Carrizales, Holzer, Kim & Kim, 2006; Holzer & Manoharan, 2016; Melitski, Holzer, Kim, Kim & Rho, 2005).

Sampling the largest municipalities was consistent with previous e-governance findings, which generally show a positive association between population and e-governance capacity, especially at the local level (Moon, 2002; Moon & deLeon, 2001; Musso et al., 2000; Norris & Moon, 2005). Furthermore, both the political economy and the innovation diffusion literature provide a rationale for using population and organizational size as a determinant of organizational capacity for technological innovation.

Weare, Musso & Hale, (1999) asserts that electronic democracy is a public good because it is relatively non-excludable and non-rivalistic. As such, communities with greater populations will stimulate greater demand for digital information and services, leading to the development of e-government by public entities. Weare et al. (1999) goes on to propose several theoretical justifications for the relationship between organization and community size with technology adoption. They include: lower average costs due to economies of scale, increased number of users, wealthier citizens, and greater financial capacity.

Beyond political economy arguments, cultural acceptance of technology by residents may also be a mitigating factor (Guthrie & Dutton, 1992). Diffusion of innovation theory further asserts that cultural factors enhance implementation and adoption of digital government when organizational size increases. Rogers (1983) argues that the availability of direct and

slack resources enhances fiscal capacity in large organizations facilitating the adoption and implementation of technological innovations.

Contrary to assertions that smaller organizations are more flexible and have greater abilities to change (Hage, 1980; Utterback & Abernathy, 1975), many organizational studies have found that organizational size and innovation are correlated. For example, organizational studies demonstrate that as the size of an organization increases so does the willingness and capacity to adopt new technologies (Aarons, Hurlburt, & Horwitz, 2011; Daft, 1978; Damanpour, 1992; Greenhalgh et al., 2004; Kimberly & Evanisko, 1981; Nord & Tucker, 1987; Weare et al., 1999).

Our study data was from the E-governance Institute's "Digital Government in Municipalities Worldwide" surveys on global municipal e-governance, which were conducted every two years beginning in 2003. Such bi-annual surveys permitted a reasonable timeframe for municipal governments to re-examine their online features and introduce necessary changes. This approach resulted in a longitudinal assessment of municipal e-governance and helped to identify the best case studies in various aspects of e-governance.

The initial findings from the 2013 study demonstrated that all 100 selected cities had official websites. This was a marked increase from previous studies conducted in 2011 and 2009, when 92 and 87 cities, respectively, had official websites.

Similar to previous studies, our study evaluated the official websites of 100 cities in their respective native languages in order to capture citizens' perspectives of their government online.

The survey instrument for website evaluation consisted of 104 measures which were classified into five distinct categories: (1) privacy and security, (2) usability, (3) content, (4) services, and (5) citizen and social engagement.

The privacy and security category focused on the presence of privacy policies on official municipal websites and steps that were taken to authenticate website users. The usability category examined website navigation and functionality, while the content category addressed the availability of public documents online, contact information, multimedia, time-sensitive information, and the extent to which the website was accessible to persons with disabilities. The services category determined the provision of online transaction features, which include applications, payments, and registration for city events. Finally, the citizen and social engagement category focused on opportunities for citizen engagement/participation online, along with social media applications that were added since the 2011 survey. Table 1 lists the five e-governance categories and the respective keywords.

Among the 104 measures in the survey instrument, 43 were dichotomous. Non-dichotomous measures were graded on a four-point scale of 0–3, as shown in Table 2. The dichotomous measures in the privacy category were graded either 0 or 1. The measures in

**Table 1.** E-Governance performance measures.

E-governance Category	Keywords
Privacy/Security	Privacy policies, authentication, encryption, data management, cookies
Usability	User-friendly design, branding, length of homepage, targeted audience links or channels, and site search capabilities
Content	Access to current accurate information, public documents, reports, publications, and multimedia materials
Services	Transactional services - purchase or register, interaction between citizens, businesses and government
Citizen and Social Engagement	Online civic engagement/ policy deliberation, social media applications, citizen based performance measurement

**Table 2.** E-governance scale.

Scale	Description
0	Information about a given topic does not exist on the website
1	Information about a given topic exists on the website (including links to other information and e-mail addresses)
2	Downloadable items are available on the website (forms, audio, video, and other one-way transactions, popup boxes)
3	Services, transactions, or interactions can take place completely online (credit card transactions, applications for permits, searchable databases, use of cookies, digital signatures, restricted access)

the services and citizen and social engagement categories were graded on a scale of 0-3, as they required higher technical competence. Each of the five categories had 18-20 measures and they were weighted equally to reduce skewed data or statistical bias. Each website was assessed by two evaluators in order to establish reliability, and websites that had significant score differences (more than 10%) were evaluated by a third evaluator.

Ward's method (linkage cluster analysis) was performed using Stata 13 to group municipalities into four clusters, based on their performance in the five categories. In addition, a path analysis was used to explore the influence of Internet usage, education, democracy, and economy on the performance of e-governance.

## Results and findings

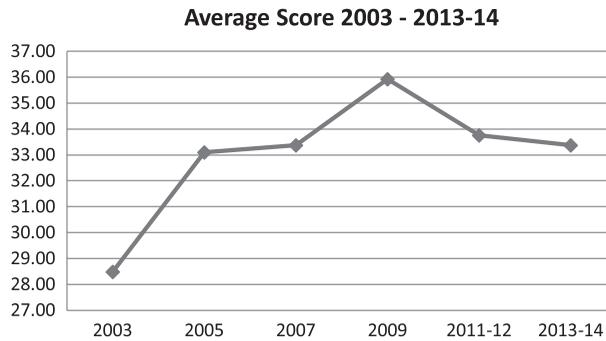
### *Cities rankings and scores*

The following section discusses the results of the 2013 worldwide municipalities e-governance survey. It includes the top overall and category-specific rankings, along with longitudinal trends in municipal e-governance. This is followed by a discussion of the results of the cluster and path analyses. As stated earlier, all of the cities that were selected for the survey had established official municipal websites. This by itself is a significant milestone in municipal e-governance globally.

The average score of the cities evaluated was 33.37, a slight decrease compared to the scores in 2011 (33.76) and 2009 (35.93). Among the categories, the average scores of cities improved only in the content category, and marginally decreased in the other four categories. This is explained by the low scores of cities with new websites. Figure 1 shows the longitudinal trend in overall scores since 2003.

The top five cities in the e-governance survey (based on overall scores) were Seoul, New York, Hong Kong, Singapore, and Yerevan. Seoul ranked first with a score of 85.80, improving from 82.23 in 2011. New York ranked second with 66.15, a significant improvement from its sixth position in 2011. Other cities in the top five rankings were Hong Kong (60.32), Singapore (59.82), and Yerevan (59.61). Seoul and Hong Kong were also ranked in the top five best cities in the previous 2011 survey. The highest ranked cities in each continent were Johannesburg (Africa), Seoul (Asia), Bratislava (Europe), New York (North America), Auckland (Oceania), and Sao Paulo (South America). New to these top rankings for each continent were Bratislava and New York, which replaced Madrid and Toronto, respectively.

The highest ranked municipalities and their scores are listed in Table 3, and the top five municipalities in each category are provided in Table 4.



**Figure 1.** Average e-governance score 2003 – 2013.

**Table 3.** Overall e-governance rankings (2013).

Rank	City	Country	Score
1	Seoul	Korea (Rep.)	85.80
2	New York	United States	66.15
3	Hong Kong	Hong Kong, China	60.32
4	Singapore	Singapore	59.82
5	Yerevan	Armenia	59.61
6	Bratislava	Slovak Republic	58.31
7	Toronto	Canada	58.05
8	Shanghai	China	56.02
9	Dubai	United Arab Emirates	55.89
10	Prague	Czech Republic	54.88
11	Vilnius	Lithuania	53.82
12	Vienna	Austria	53.40
13	Oslo	Norway	52.52
14	Stockholm	Sweden	52.25
15	London	United Kingdom	51.90
16	Helsinki	Finland	51.27
17	Macao	Macao, China	48.69
18	Mexico City	Mexico	47.01
19	Kuala Lumpur	Malaysia	46.16
20	Zurich	Switzerland	45.36

### ***Longitudinal findings***

Based on data collected since 2003, we found that the average level of e-governance fluctuates, instead of constantly increasing. Scores increased from 2003 (average of 28.49) to their highest point in 2009 (average of 35.93). In 2005, the average score was 33.11 and in 2007, it was 33.37. The average increased slightly to 33.76 in 2011 and dropped to 33.37 in the latest 2013 survey. The previous Figure 1 reflects this trend of e-governance in the past six surveys. Table 5 and Figure 2 below show the changes in each category since 2003.

Similar to overall e-governance performance, individual categories did not necessarily increase across each of the survey years. Instead, some categories saw improvement since 2005 while others did not.

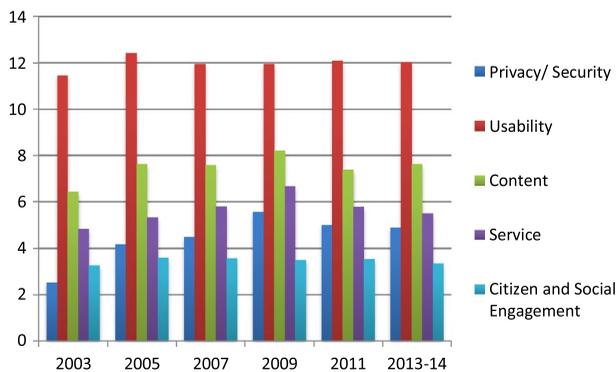
The data since 2003 indicated varying gaps among these categories, with the smallest gap in usability and the largest gap in citizen and social engagement (except in the year 2003). This reflects a reality that governments are more likely to devote their efforts to building great websites with many functions or comprehensive tools, but they do not always enable

**Table 4.** Top Ranking Cities by Category (2013).

	Rank	City	Country	Score
Privacy and Security	1	Seoul	Korea (Rep.)	16.30
	2	Vilnius	Lithuania	15.56
	3	Prague	Czech Republic	14.07
	3	Oslo	Norway	14.07
	5	Dubai	United Arab Emirates	13.71
Usability	1	Yerevan	Armenia	17.82
	2	Bratislava	Slovak Republic	16.88
	3	Seoul	Korea (Rep.)	16.57
	3	Toronto	Canada	16.57
	3	Zurich	Switzerland	16.57
Content	1	Seoul	Korea (Rep.)	17.46
	2	Toronto	Canada	16.19
	2	Stockholm	Sweden	16.19
	4	Yerevan	Armenia	14.92
	5	New York	United States	14.45
Services	1	Seoul	Korea (Rep.)	16.72
	2	Shanghai	China	15.41
	3	New York	United States	15.25
	4	Dubai	United Arab Emirates	13.77
	5	Stockholm	Sweden	13.11
Citizen and Social Engagement	1	Seoul	Korea (Rep.)	18.75
	2	Singapore	Singapore	11.46
	3	Yerevan	Armenia	11.04
	4	Vienna	Austria	10.21
	5	Shanghai	China	9.58

**Table 5.** Average score by categories since 2003.

	Privacy/ security	Usability	Content	Service	Citizen and social engagement
2003	2.53	11.45	6.43	4.82	3.26
2005	4.17	12.42	7.63	5.32	3.57
2007	4.49	11.95	7.58	5.8	3.55
2009	5.57	11.96	8.21	6.68	3.5
2011	4.99	12.09	7.38	5.78	3.53
2013-14	4.88	12.04	7.62	5.49	3.34



**Figure 2.** Average score by categories 2003 – 2013.

citizens to access “real” services and online engagement. These findings are consistent with Melitski and Calista (2016), who attributed a decline in service and social engagement to innovation diffusion.

## Cluster analysis results

Table 6 contains results of the cluster analysis. All of the municipalities were divided into four groups, according to their performance in the five categories. These four clusters were (1) digitally mature cities, (2) digitally moderate cities, (3) digitally minimal cities, and (4) digitally marginal cities. There were 25 high performing e-governance cities that were considered digitally mature. Another 25 were digitally moderate cities. There were 16 cities in cluster 3 (digitally minimal cities), while the remaining 36 cities were in cluster 4 (digitally marginal cities).

Table 7 and Figure 3 detail each cluster in e-governance. In cluster 1 (digitally mature cities), overall scores and scores for each category were the highest among the four clusters (these 25 cities represented the highest level). Although the overall score for cluster 3 (digitally minimal cities) was 1.15 lower than cluster 2 (digitally moderate cities), this score resulted from the poor performance of these municipalities in the first category (privacy and security). Except for that category, all scores for the remaining four categories were higher than in cluster 2 (digitally moderate cities). Cities in cluster 4 (digitally marginal cities) had the lowest scores in individual and overall categories.

Table 8 displays the differences in democracy, Internet usage, education, and economy among these four clusters. The data indicates that municipalities in cluster 1 (digitally mature cities) had the highest level of democracy, Internet usage, education, and economy, while cities in cluster 4 had the lowest levels in these categories.

**Table 6.** Cluster analysis results.

Cluster	N	Municipalities (Rankings)
Cluster 1	25	Seoul (1), New York (2), Hong Kong (3), Singapore (4), Yerevan (5), Bratislava (6), Toronto (7), Shanghai (8), Dubai (9), Prague (10), Vilnius (11), Vienna (12), Oslo (13), Stockholm (14), London (15), Helsinki (16), Macao (17), Mexico City (18), Zurich (20), Auckland (22), Brussels (23), Copenhagen (24), Tokyo (25), Guayaquil (30), Bogota (37)
Cluster 2	25	Kuala Lumpur (19), Sao Paulo (21), Buenos Aires (26), Jerusalem (27), Schaan (28), Madrid (29), Dublin (31), Berlin (33), Sydney (35), Lisbon (38), Muscat (39), Riyadh (41), Johannesburg (42), Mumbai (47), Warsaw (48), Zagreb (51), Istanbul (55), Saint Joseph (57), Athens (58), Amsterdam (59), Ljubljana (60), Cairo (63), Hamilton (65), Tehran (71), Valletta (88)
Cluster 3	16	Luxembourg (32), Tallinn (34), Montevideo (36), Almaty (40), Belgrade (43), Lima (44), Paris (45), Minsk (46), San Marino (49), Riga (50), Guatemala City (52), Bucharest (53), Chisinau (54), Rome (56), Santiago (61), Tbilisi (62)
Cluster 4	34	Jakarta (64), Panama City (66), Sofia (67), Santo Domingo (68), Moscow (69), San Salvador (70), Sarajevo (72), Budapest (73), Nicosia (74), Kiev (75), Ho Chi Minh (76), Amman (77), Lagos (78), Bangkok (79), Caracas (80), Tunis (81), Quezon City (82), Tirane (83), Casablanca (84), Baghdad (85), Karachi (86), Kathmandu (87), Colombo (89), Asuncion (90), Nairobi (91), Kuwait City (92), Dhaka (93), Manama (94), Santa Cruz de la Sierra (95), San Juan (96), Tashkent (97), Bandar Seri Begawan (98), Accra (99), Castries (100)

**Table 7.** Average score by cluster.

	Overall Score	Privacy/security	Usability	Content	Services	Citizen & social engagement
Cluster 1	52.92	9.62	14.57	12.25	9.84	6.64
Cluster 2	34.12	8.42	11.79	6.76	5.09	2.06
Cluster 3	32.97	0.95	13.11	8.45	5.81	4.65
Cluster 4	18.63	0.64	9.86	4.45	2.44	1.24

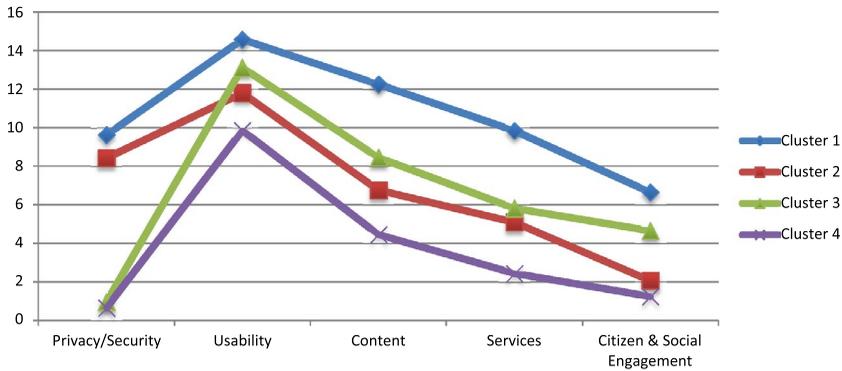


Figure 3. Average score by cluster.

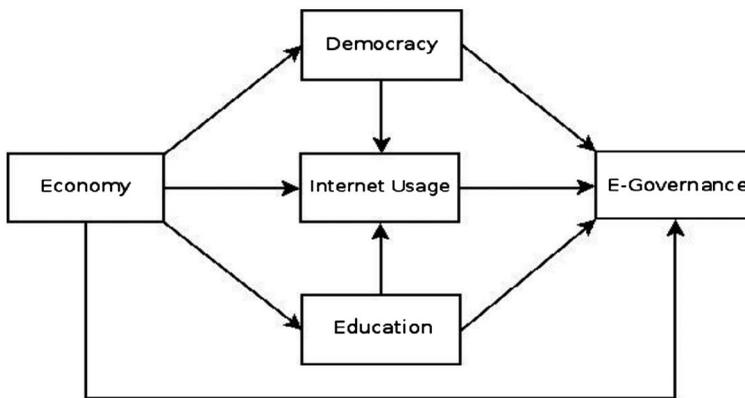


Figure 4. Theoretical model.

Table 8. Comparison of city clusters.

	Democracy index	Internet users (per 100 inhabitants)	Mean years of schooling	Per capita GDP
Cluster 1	7.26	75.53	10.88	38746
Cluster 2	6.78	64.26	9.63	22605
Cluster 3	6.61	57.81	10.19	20551
Cluster 4	5.36	43.05	8.02	9267

**Path analysis model**

E-governance reflects a mechanism for governments to provide digital information and services, as well as engaging citizens online. There are multiple factors that influence the performance of e-governance, both internal and external to the organization. Some of the internal factors important for the adoption of e-governance are capacity and willingness (Zheng & Manoharan, 2016).

Municipalities with a higher level of technical, financial, administrative, and political capacities, as well as a strong willingness to use ICT, are likely to perform better in e-governance. Previous e-governance research has also identified external factors that influence

the adoption of e-governance, such as Internet usage, education, democracy, and economy (Bavec & Vintar, 2007; Zheng & Holzer, 2013).

Greater Internet usage among citizens brings more public needs toward digital services and motivates governments to develop e-governance. The level of education in a community suggests a greater role for citizens in acquiring knowledge and skills to use computers, the Internet, and mobile technologies. In addition, higher educational attainment suggests a greater understanding of civic responsibilities and increases citizen abilities to engage their government, access online services, and participate in public affairs through digital technologies. Therefore, municipalities with higher levels of education are more likely to have increased levels of Internet usage and better e-governance performance.

Additionally, countries with higher democracy levels are more likely to be transparent and motivate their citizens to use the Internet. As argued by Zheng & Holzer, (2013), governments in more democratic environments have a greater willingness to engage citizens. As a result, the e-governance level in democratic countries is likely to be higher.

In addition to variables related to Internet usage, education, and democracy, the research also includes economic indicators. Das, DiRienzo, & Burbridge, (2009) emphasized the positive relationship between per capita gross domestic product (GDP) and e-government development. A better economy enables governments to provide greater funding to develop and sustain e-governance through innovative technologies.

Based on the above discussion, the following model has been proposed:

The data for these variables was collected from different sources. Internet usage was measured by Internet users (per 100 people), and the data was collected from the World Telecommunication/ICT Development Report and a database from the ITU. The mean years of schooling was used to measure education level with data from the Human Development Report. Democracy was measured using the democracy index compiled by the Economist Intelligence Unit and data from the 2013 democracy index. GDP per capita from the UN Department of Economic and Social Affairs was used to measure the condition of the economy in the target country. Table 9 shows the descriptive statistics for these variables.

The final sample size was 92 municipalities and the R-squared was 0.38, reflecting the overall model fit. The results confirmed the direct influence of Internet usage on e-governance, indicating that municipalities with higher levels of Internet usage were more likely to have better performance in e-governance. This suggests that local governments were meeting the demands of their citizens. Although education did not have a direct impact on e-governance, it might have influenced e-governance through Internet usage. The results also supported the fundamental role of the economy and the impact that it can have on e-governance, both through influencing education and Internet usage. However, the democracy index had neither a direct nor indirect influence on e-governance scores. The results of a path analysis are shown in Table 10 and Figure 5 below.

**Table 9.** Descriptive statistics.

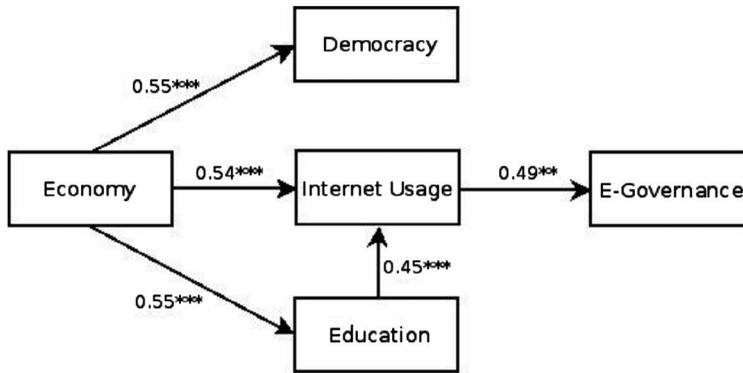
Variable	Mean	Std. Dev.	Min	Max
E-Governance	33.37	14.78	5.03	85.80
Internet Usage	58.83	22.93	6.50	95.30
Democracy	6.43	1.98	1.72	9.93
Education	9.47	2.33	3.20	12.90
Economy	21595.34	22564.30	694.10	110664.80

**Table 10.** Path analysis results.

	E-Governance	Internet usage	Democracy	Education
Internet Usage	0.49**			
Democracy	0.07	- 0.02		
Education	0.08	0.45***		
Economy	0.04	0.54***	0.55***	0.55***

Note: Final Sample Size: 92.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

**Figure 5.** Path analysis results.

### Discussion and implications

The paper compiled bi-annual data between 2003 and 2013 from website surveys of the largest municipalities in the 100 most wired nations worldwide based on five categories: privacy/security, usability, content, service, and citizen and social engagement. The overall average score for the municipalities evaluated in 2013 survey is 33.37, a decrease from 33.76 in 2011 and 35.93 in 2009. The data since 2003 shows that the average score had been increasing until 2009, when it reached the maximum, and then decreased. The changes could be partly explained by the new municipalities included in the 2013 survey (100 municipalities were evaluated in the 2013 survey; 92 in the 2011 survey; and 87 in the 2009 survey). These newly included municipalities received lower scores as they are at their early stages of e-governance development.

Many factors, both inside and outside government, tend to influence e-governance performance. Additionally, change in leadership, new priorities and policies, government capacity and willingness to adopt the latest information technologies could possibly result in changes to e-governance performance. As a result, the average score of e-governance at the municipal level worldwide tends to keep shifting and such trends need to be continuously examined by future studies.

The latest data indicates that large gaps exist. Cluster analysis was used to divide the municipalities into four groups based on their e-governance performance. The average score for cluster 1 (digitally mature cities) is 52.92; for cluster 2 (digitally moderate cities) is 34.12; for cluster 3 (digitally minimal cities) is 32.97; and for cluster 4 (digitally marginal cities) is 18.63. The average for cluster 1 (digitally mature cities) is 18.80 points higher than cluster 2 (digitally moderate cities) and 34.29 points higher than cluster 4 (digitally marginal

cities). These gaps indicate an imbalance in e-governance development at the municipal level worldwide.

Moreover, there are wide variances in the cities' performance among the five e-governance categories, with an average score of 12.04 in usability and only 3.34 in citizen and social engagement. This gap indicates that municipal governments tend to focus more on branding and website functionality, such as search tools, website colors, online forms, etc., rather than providing opportunities for citizen engagement online.

This study has some limitations with regard to sample size and variables used in the research. The final sample includes only 100 cities and the variables used in the path analysis are from the national level, due to limited data at the municipal level worldwide. However, even with these limitations, this study introduces new insights on the progress of e-governance development at the municipal level worldwide and contributes to the e-governance literature by helping to understand how external factors, such as Internet usage, education, and the economy, influence e-governance development.

This study assessed the role of Internet usage, education, democracy, and economy on municipal e-governance performance. It was based on the assumption that a positive socio-economic environment motivates governments to allocate resources to develop and sustain e-governance. Path analysis was used to test the effect of these factors, and the results indicate that Internet usage had direct and significant influence on e-governance performance. Municipal governments were more likely to develop e-governance when more citizens were using the Internet.

Although education and economy did not have a direct impact on e-governance performance, they could still influence government performance in e-governance through Internet usage. Unsurprisingly, Internet usage levels are usually higher where education and the economy are better. However, democracy had neither a direct nor indirect influence on whether e-governance was supported. This suggests that democracy was not a significant determinant of e-governance at the municipal level. This confirms previous findings that the municipalities with higher e-governance performance are not necessarily in nations with high levels of democracy (Holzer, Manoharan & Van Ryzin, 2010).

## **Conclusion and recommendations**

This research explores the e-governance trends among global municipalities and examines factors that play an influential role in its adoption. Our study shows that the adoption of e-governance at the municipal level worldwide is still low with an average of 33.37 out of 100. Gaps exist among different categories in e-governance, with online engagement being much lower than other categories. Although information and communication technologies continue developing rapidly, e-governance adoption and development is complex with many factors involved, resulting in fluctuation over time.

To better understand the external determinants of e-governance development, path analysis was used to examine the influence of Internet usage, democracy, education, and the economy. This study's findings indicate that Internet usage has a direct impact on e-governance. Additionally, education and the economy could influence e-governance through Internet usage.

This research provides guidance for practitioners and researchers alike. For practitioners, municipalities should ensure that their websites are user friendly by employing targeted

audience links and customizing websites for specific groups like citizens, businesses, tourists and other public agencies. Branding websites requires consistent colors, fonts, graphics, limiting screen lengths, and organizing websites so that they are relevant to users. Municipal websites need to clarify system requirements and recognize that many users access public websites through multiple modalities including mobile technologies. Furthermore, search engine optimization is important for native search applications as well as external search engines like Google, Bing, etc.

Municipalities need to keep the content of their websites current with regular updates on local government policies, decisions, and community related events. The websites should enable citizens to easily access public documents such as city codes, charters, agency mission statements, public meeting records, budgetary information, and other time sensitive materials. Such access to public documents, along with multimedia materials, multi-lingual content and materials for disabled users, enhances agency transparency and citizen trust in government.

The websites should also provide clear, concise and easily accessible privacy and security policies that address the collection and use of website data. If third party vendors will have access to data collected by a city's website, this practice should be clearly stated along with the intended use of such data. The website users should also be informed if their data is available using open-government platforms. Furthermore, they should have the option to decline disclosure of personal information. The definition of third parties should include private businesses or nonprofits, but it should also include other agencies at the municipal, district, state, regional, or national levels.

Many municipalities use their websites to facilitate transactions between users and their local government; the most common would be the submission of forms, requesting information, filing complaints, applying for permits, and paying taxes, fines, or utilities. Municipal websites should build onto their e-commerce and customer relations management systems to allow users to register for events, bid on local government projects, and participate in economic development initiatives. With increased access to the Internet, and the increasingly central function that it plays in many people's lives, citizens and other users expect to further engage their local governments online. Therefore, it is important for municipalities to provide access to their online services through multiple platforms including mobile technologies.

The use of online platforms and social media engages citizens and encourages citizen participation in local government decisions. Citizens should have the opportunity to provide feedback on local government policies online. Our study found that online citizen satisfaction surveys, opinion polls, social media, and digital forums were used by the leading municipal governments to enhance citizen engagement.

Municipalities can use their websites and social media to make a clear statement that citizen participation in government is encouraged. By using platforms such as Facebook, Twitter, Instagram, YouTube, and other social media applications, municipalities gain feedback and helpful insights from users thereby enabling more informed decisions and better service to citizens. As governments at all levels adopt new technologies, it is also important that they provide adequate training to their employees and develop in-house skills to effectively implement these technologies.

This research is also relevant to digital government researchers. Consistent with other research (Calista & Melitski, 2017), this study shows that after 2009 when e-governance

achieved the highest point, the average e-governance level dropped. This indicates that e-governance is not simply technology-driven and may be impacted by other factors. Rogers (1962) suggests that innovations diffuse along a logistical, or s-shaped curve. In other words, new innovations are adopted slowly at first, followed by dramatic increases in usage before leveling off. Our results are consistent with such innovation diffusion research.

The findings from this longitudinal study suggest that local government websites were diffusing innovation as website performance expanded rapidly before peaking in 2009. The external factors such as the economy, education levels, and capacity of citizens to use the Internet were examined and help provide context for the declines. Further, the worldwide economic slow-down in 2008, followed by changes in local government priorities, policy drift, and regime changes may also have contributed to the declines in e-government performance.

Looking forward, researchers should continue assessing website performance at municipal and other levels of local government. They must also account for new technological innovations enabling governments to involve citizens and stakeholder groups. Future research needs to assess local government use of mobile technologies, open government data platforms, and multi-channel social media approaches to improve service delivery, enhance transparency, and better engage their citizens.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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