Digital Governance: An Assessment of Performance and Best Practices

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Abstract

Over the past decade, e-government has evolved from providing static content and services to integrating user generated content and social media technologies. This allows citizens to participate and provide regular feedback on policies and programs, both of which promote public value through e-democracy. However, few studies continue to track their performance on a worldwide scale. This article discusses the results of a global and comparative survey of e-government performance, based on an assessment of municipal government websites around the world. Along with a longitudinal assessment, the study identifies best practices, highlights key findings, and provides guidance for future research.

Keywords e-government · Websites · Cities · Performance · Citizens

Introduction

The diffusion of information and communication technologies (ICTs) is central to the study of e-government (Calista & Melitski, 2007). The use of ICT tools can improve public trust when governments promote transparency, accountability, and government responsiveness (Milakovich, 2010). Traditionally marginalized sections of society can also participate in the policy making process through multiple channels, resulting in more legitimate decisions and effective implementation (Manoharan & Melitski, 2019). The adoption of digital government also has the potential to develop more socially inclusive and sustainable communities worldwide.

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Along with e-government and e-democracy, the concepts of open government and transparency are new paradigms which emphasize access to data and its reuse, and thereby promote interoperability and innovation (Hansson et al., 2015). In the open government paradigm, the technology is secondary; the focus is "on the interoperability, openness, and participatory dimension that the technology might enhance, as well as on a fundamental change of how governments operate" (p.5). Citizens are becoming proactive stakeholders in public service delivery rather than passive recipients. Open government and the improved quality of citizen participation are having a positive influence on public trust in government (Moon, 2018).

From a public values framework, e-government creates value in several distinct areas. Public value theory examines how transparency, accountability, efficiency, and openness create public value (Nabatchi, 2018; Panagiotopoulos et al., 2019). Calista and Melitski (2007) assert that the implementation of technological innovations creates value through two distinct perspectives. The first perspective is managerial in nature and seeks performance improvements in the delivery of existing public services in terms of quality and quantity. A second method for creating public value is derived by creating systems that improve democratic governance by engaging citizens, increasing transparency, and enhancing trust in government. A third category for public value is derived from the information systems literature, represented by the client or end user who experiences the system on behalf of themselves, their families, or any organizational associations they may have ranging from corporate interests to nonprofit organizations (MacLean & Titah, 2021; Kelly et al., 2002). Public value is created through each of these perspectives and is particularly relevant as ICTs mature.

Early e-government maturational studies describe an emphasis on Web 1.0 applications providing static content online that then extends to transactional services (Layne & Lee, 2001; Brown, 2007; Moon, 2002). As technology and communication tools advanced, the public sector enhanced citizen engagement and transparency through the use of mobile technologies, smart technologies, and social media. Citizen use of mobile and smart technologies is increasing as are the various forms of governance such as m-governance, smart governance, and ubiquitous government. The primary emphasis of smart cities and governments is the promotion of public value through the use of ICTs and internet-enabled devices like cameras and sensors to improve the quality of life (Manoharan & Mossey, 2019). But, these advances require multiple channels of communication and participatory mechanisms for citizens. Many local governments are also using social media to connect and engage with their citizens in the policy process (Mainka et al., 2015). Governments are looking beyond traditional web services towards a further progression of e-government called "we-government" (Linders, 2012). There is also today a widely recognized concept of Government 2.0, which is distinct from Web 1.0. Meijer et al. (2012) views Government 2.0 as "a more open, social, communicative, interactive, and user-centered version of e-government".

Many governments are responding by ensuring that their e-government components are mobile compatible and accessible. However, some cities are still at Web 1.0. They offer few opportunities for public participation and interaction with government. They operate largely in the e-government paradigm and are

making comparatively little progress towards the e-participation or open government paradigm.

When viewed from a global and comparative perspective, the adoption of e-government, both at the national and local levels, has varied considerably. A 2015–16 study of global municipalities (Holzer & Manoharan, 2016) determined that cities are at different stages of e-government adoption, with regard to their website privacy and security, usability, content, services, and citizen and social engagement. Some cities and local governments may not be able to sustain their performance over time as research has shown some late adopters may overtake the early adopters in e-government performance (Calista et al., 2010). And, the failure rates of e-government projects remain high. It is therefore important to continuously monitor and benchmark the performance of e-government on a global scale (Gil-García, 2006; Heeks, 2003). Such studies can highlight best practices in various dimensions of e-government and encourage cities to learn and adopt new innovative practices. This is particularly important for local governments that operate with limited resources and budgetary constraints.

The Global E-Government Survey project measures the performance of digital governance in large municipalities from around the world. This longitudinal study, conducted bi-annually since 2003, evaluates the city's official websites and ranks them on a global scale.

Methodology

Consistent with previous surveys conducted by the *E-governance Institute*, the 2018–19 survey identified the top 100 cities within the most wired nations based on data from the International Telecommunication Union (ITU), which is affiliated with the United Nations (UN). Previous research consistently shows a positive relationship between population and e-government capacity (Manoharan, 2013; Moon, 2002; Zheng & Manoharan, 2016). Given the relationship between a city's e-government capacity and its population, the largest city by population was selected from these 100 nations. Each city was considered a surrogate for all cities in its respective nation. Next, their official websites were identified and evaluated in their native languages. The website URLs are listed in Appendix 1.

The survey used a comprehensive e-governance index of 86 measures, classified into five categories: 1) Privacy and Security; 2) Usability; 3) Content; 4) Services; and, 5) Citizen and Social Engagement. For each category, 14 to 23 questions were asked, and each question was coded either on a four-point scale (0, 1, 2, 3) or a dichotomy of two points (0, 3 or 0, 1). The categories were all equally weighed in calculating the overall score for each municipality. This avoided skewing the research in favor of any specific category regardless of the number of questions in each category. Table 1 summarizes the survey instrument, and Appendix 2 presents an overview of the criteria.

Table 1 E-Government performance measures

E-Governance category	Key concepts	Raw score	Weighted score	Keywords
Privacy/Security	14	20	20	Privacy policies, authentication, encryption, data management, cookies
Usability	15	27	20	User-friendly design, branding, length of homepage, targeted audience links or channels, and site search capabilities
Content	23	53	20	Access to current accurate information, public, documents, reports, publications, and multi-media materials
Services	18	52	20	Transaction services- purchase or register, interaction between citizens, businesses and government
Citizen and social engagement	16	41	20	Online civic engagement/ policy deliberation, social media applications, citizens-based performance measurement
Total	86	193	100	

Results and Discussion

The following section discusses the survey results for 2018–19, and Table 2 lists the rankings and scores of each municipality. As stated earlier, the highest possible score for any city is 100, and this represents the aggregate of each city's scores in the five categories.

Seoul ranked first in the survey with an overall score of 84.07, increasing its score from the previous survey in 2015–16. Madrid was second with a score of 80.51, increasing its score from 69.24 in 2015–16. Similarly, Yerevan improved its score from 59.61 in 2015–16 to 67.59 in the latest survey. Auckland and Paris completed the ranking at fourth and fifth positions, both showing significant improvements from 54.27 to 67.24 and 41.43 to 65.02, respectively. The highest ranked cities in each continent were Johannesburg (Africa), Seoul (Asia), Madrid (Europe), Toronto (North America), Auckland (Oceania), and Montevideo (South America).

Table 3 lists the top 20 municipalities from the 2018–19 survey, with total and category scores. Madrid had the highest score for Privacy and Security as well as Usability. Seoul was the top scoring city in Content and Services. Finally, the top three cities in Citizen and Social Engagement were Shanghai, Auckland, and Seoul.

Results by E-Governance Categories

The following section further discusses the survey results based on the five categories.

Table 4 highlights selected features from each category and shows the percentage of cities offering them on their official websites.

Privacy and Security

For Privacy and Security, the top-ranked cities in 2018–19 were Madrid, Seoul, Yerevan, Bratislava, Singapore, Toronto, New York, Buenos Aires. The average score for all cities in this category was 6.16, an increase from a score of 5.55 in 2015–16. Madrid ranked first, a significant improvement from its tenth place ranking in the previous survey. Seoul improved its ranking from sixth in 2015–16. Yerevan also registered a remarkable improvement from fifty-fourth place with a score of 3.7 in 2015–16 to a score of 15.50 in 2018–19. Bratislava ranked 4th with a score of 14.00, another improvement from its thirteenth-place ranking in 2015–16 and its score of 11.85. Tied for fifth place with scores of 13.00 are Singapore, Toronto, New York, Buenos Aires (ranked thirteenth in 2015–16).

Usability

In the category of Usability, the top-ranking cities were Madrid, Buenos Aires, Shanghai, Singapore, Kuala Lumpur, Bangkok, Oslo, and Yerevan. All the cities

Table 2 Overall E-Government rankings (2018–19)

Rank	City	Country	Score	Rank	City	Country	Score
1	Seoul	Korea (Rep.)	84.07	51	Brussels	Belgium	35.27
2	Madrid	Spain	80.51	52	Tbilisi	Georgia	34.35
3	Yerevan	Armenia	67.59	53	Sao Paulo	Brazil	33.73
4	Auckland	New Zealand	67.24	54	Vienna	Austria	33.71
5	Paris	France	65.02	55	Guatemala City	Guatemala	32.56
6	Singapore	Singapore	64.63	56	Zagreb	Croatia	32.51
7	Amsterdam	Netherlands	60.74	57	Panama City	Panama	32.37
8	Helsinki	Finland	60.72	58	Sofia	Bulgaria	31.13
9	Shanghai	China	60.09	59	Minsk	Belarus	31.07
10	Toronto	Canada	59.51	60	Almaty	Kazakhstan	30.45
11	New York City	USA	57.35	61	Bangkok	Thailand	30.41
12	Berlin	Germany	56.02	62	Guayaquil	Ecuador	29.47
13	Oslo	Norway	55.98	63	Mexico City	Mexico	28.57
14	Hong Kong	China	55.78	64	Port Louis	Mauritius	27.47
15	Kiev	Ukraine	55.5	65	Amman	Jordan	26.88
16	Taipei	Taiwan	53.76	66	San Juan	Puerto Rico	26.86
17	Tallinn	Estonia	52.95	67	Ho Chi Minh City	Vietnam	26.06
18	Sydney	Australia	52.2	68	Bucharest	Bulgaria	26.02
19	Vilnius	Lithuania	51.75	69	Tirana	Albania	25.66
20	Stockholm	Sweden	51.31	70	San Fernando	Trinidad and Tobago	25.09
21	Athens	Greece	51.11	71	Casablanca	Morocco	24.96
22	Lisbon	Portugal	50.74	72	Budapest	Hungary	24.7
23	Montevideo	Uruguay	50.01	73	Cairo	Egypt	24.6
24	Buenos Aires	Argentina	49.7	74	Skopje	Macedonia	24.44
25	London	United Kingdom	48.91	75	Sana'a	Yemen	23.81
26	Johannesburg	South Africa	48.45	76	Santo Domingo	Dominican Rep.	23.76
27	Bogota	Columbia	47.7	77	Ulaanbaatar	Mongolia	23.7
28	Istanbul	Turkey	47.66	78	Jakarta	Indonesia	23.58
29	Copenhagen	Denmark	47.43	79	Dhaka	Bangladesh	23.24
30	Kuala Lumpur	Malaysia	47.04	80	Warsaw	Poland	22.3
31	Luxembourg City	Luxembourg	46.13	81	Bishkek	Kyrgyzstan	21.95
32	Moscow	Russia	46	82	Tashkent	Uzbekistan	21.22
33	Rome	Italy	45.89	83	Katmandu	Nepal	20.81
34	Tokyo	Japan	45.54	84	Lima	Peru	20.56
35	Zurich	Switzerland	45.43	85	Tunis	Tunisia	20.18
36	Tehran	Iran	45.03	86	Colombo	Sri Lanka	19.74
37	Prague	Czech Republic	44.44	87	Caracas	Venezuela	18.44
38	Dubai	United Arab Emirates	43.49	88	Santiago	Chile	18.2
39	Ljubljana	Slovenia	42.96	89	Karachi	Pakistan	17.9

Table 2 (continued)

Rank	City	Country	Score	Rank	City	Country	Score
40	Nicosia	Cyprus	42.45	90	Belgrade	Serbia	17.48
41	Riyadh	Saudi Arabia	42.22	91	Manama	Bahrain	16.85
42	Jerusalem	Israel	41.54	92	Beirut	Lebanon	16.46
43	Muscat	Oman	41.14	93	Gaza	Palestine	16.07
44	San Jose	Costa Rica	39.46	94	Damascus	Syria	14.08
45	Dublin	Ireland	39.34	95	San Salvador	El Salvador	12.95
46	Bratislava	Slovakia	38.51	96	Addis Ababa	Ethiopia	11.91
47	Chisinau	Moldova	38.32	97	Manila	Philippines	11.6
48	New Delhi	India	37.24	98	Baku	Azerbaijan	10.53
49	Sarajevo	Bosnia	36.25	99	Algiers	Algeria	6.74
50	Doha	Qatar	35.83	100	Riga	Latvia	–

Table 3 Top 20 Cities in digital governance (2018–19)

Rank	City	Overall	Privacy	Usability	Content	Services	Citizens and social engagement
1	Seoul	84.07	18	15.93	17.78	18.46	13.9
2	Madrid	80.51	20	17.78	14.07	15	13.66
3	Yerevan	67.59	15.5	16.3	11.11	13.46	11.22
4	Auckland	67.24	12	14.81	13.15	12.88	14.39
5	Paris	65.02	12	11.85	14.81	12.69	13.66
6	Singapore	64.63	13	17.41	12.59	12.12	9.51
7	Amsterdam	60.74	10	15.56	11.48	13.46	10.24
8	Helsinki	60.72	12.5	15.55	13.7	11.15	7.8
9	Shanghai	60.09	4	17.78	13.52	9.42	15.36
10	Toronto	59.51	13	14.44	15.56	12.12	4.39
11	New York City	57.35	13	10.74	13.7	13.08	6.83
12	Berlin	56.02	12	13.33	13.33	10.77	6.59
13	Oslo	55.98	8	16.3	13.7	11.15	6.83
14	Hong Kong	55.78	9.5	15.56	12.04	13.08	5.61
15	Kiev	55.5	12	14.44	12.96	10	6.1
16	Taipei	53.76	11	13.33	11.85	12.69	4.88
17	Tallinn	52.95	8	13.33	12.96	12.31	6.34
18	Sydney	52.2	11	14.44	11.85	8.08	6.83
19	Vilnius	51.75	10	15.56	11.11	9.23	5.85
20	Stockholm	51.31	10	15.56	11.85	10	3.9

excluding Yerevan were new to the Top 5 rankings. Madrid and Shanghai are tied for first with a score of 17.78, followed by Singapore with a score of 17.41. Kuala Lumpur and Bangkok are tied for third with a score of 17.04. Oslo and Yerevan are

Table 4 Average performance on individual features

		Oceania	Europe	Asia	Average	North America	South America	Africa
Privacy and Security	Privacy or Security Policy	100%	76%	48%	61%	66%	33%	42%
	Use of Encryption	25%	31%	17%	20%	22%	11%	14%
	Use of Cookies	100%	57%	24%	44%	33%	22%	28%
	Digital Signature	0%	10%	10%	3%	0%	0%	0%
Usability	Targeted Audience	50%	66%	40%	59%	50%	88%	64%
	Site Map	75%	73%	66%	59%	33%	55%	57%
	Search Tool	100%	97%	77%	85%	77%	88%	71%
Content	Emergency Management	100%	34%	30%	38%	27%	16%	21%
	Access for the Blind	50%	35%	27%	28%	27%	27%	7%
	Access for the Deaf	75%	17%	11%	25%	16%	22%	14%
	Wireless Technology	100%	70%	64%	64%	72%	66%	14%
	More than one Language	50%	79%	71%	57%	55%	11%	78%
	Performance Measurement	75%	24%	29%	29%	11%	33%	7%
Services	Searchable Database	100%	65%	52%	53%	38%	38%	26%
	Portal Customization	25%	10%	21%	9%	0%	0%	0%
	Access to Private Info	50%	24%	12%	24%	38%	22%	0%
Citizen and Social Engagement	Feedback Form	100%	77%	65%	65%	72%	66%	11%
	Bulletin Board	75%	27%	25%	29%	16%	27%	4%
	Policy Forum	75%	40%	25%	29%	22%	5%	11%

tied for fourth place with identical scores of 16.30. Lisbon came in fifth with a score of 15.93, and all cities scored an average of 12.40 in this category, a slight increase from 12.38 in 2015–16.

Content

For the Content category, Seoul, Toronto, Montevideo, Paris, and Madrid were the top-ranked cities. Seoul continued to rank first with a score of 17.78, followed by Toronto with a score of 15.55 improving significantly from twenty-second in the previous survey. Montevideo recorded another significant increase from sixty-first position in 2015–16 to third position with 15.19 in 2018–19. Paris, ranked thirty-seventh in 2015–16, but moved up to fourth with a score of 14.81. And, Madrid followed with a score of 14.07. The average score for all cities in this category was 7.94, a slight decrease from 8.22 in 2015–16.

Services

Seoul, Madrid, Yerevan, Amsterdam, Moscow, Hong Kong, Tehran, Istanbul, and New York were the top ranked cities in the category of Services. Seoul was again first, with 18.46, followed by Madrid, with 15.00, improving from its sixth-place score in 2015–16. Tied for third was Yerevan, Amsterdam, and Moscow with scores of 13.46. The average score in the Service category was 6.61, a slight decrease from 6.82 in 2015–16.

Citizen and Social Engagement

In the category of Citizen and Social Engagement, the top ranked cities were Shanghai, Auckland, Seoul, Madrid, Paris, and Lisbon. Shanghai was first, with a score of 15.36, an increase from tenth position in 2015–16. Auckland, ranked thirteenth in 2015–16, but ranked second in the recent survey with a score of 14.39. In third was Seoul with a score of 13.90, followed by Madrid and Paris, tied for fourth with scores of 13.66. Lisbon ranked sixth. The average score in this category was 4.10, a slight increase from 3.87 in 2015–16.

Longitudinal Assessment in Municipal E-Governance

This section highlights the longitudinal results of the Global E-gov Survey of municipal government performance based on the eight surveys conducted since 2003. The overall average score for all municipalities surveyed globally in 2018–19 was 38.80, an increase from 36.57 in 2015–16, 33.37 in 2013–14, 33.76 in 2011–2012, 35.93 in 2009, 33.37 in 2007, 33.11 in 2005, and 28.49 in 2003.

The cities' average scores in the five e-government categories has also increased compared to 2015–16. Table 5 shows the top 20 municipalities in e-government performance from the previous 3 surveys. Although average scores continue to increase, there are notable changes among the top scoring cities over time. Seoul

Table 5 Top cities in Digital Governance between 2013-14 and 2018–19

Rank	2013–14		2015–16		2018–19	
	City	Score	City	Score	City	Score
1	Seoul	85.8	Seoul	79.92	Seoul	84.07
2	New York	66.15	Helsinki	69.84	Madrid	80.51
3	Hong Kong	60.32	Madrid	69.24	Yerevan	67.59
4	Singapore	59.82	Hong Kong	67.56	Auckland	67.24
5	Yerevan	59.61	Prague	66.48	Paris	65.02
6	Bratislava	58.31	Tallinn	62.1	Singapore	64.63
7	Toronto	58.05	New York	62.02	Amsterdam	60.74
8	Shanghai	56.02	Bratislava	60.34	Helsinki	60.72
9	Dubai	55.89	Yerevan	59.61	Shanghai	60.09
10	Prague	54.88	Vilnius	59.12	Toronto	59.51
11	Vilnius	53.82	Buenos Aires	57.88	New York City	57.35
12	Vienna	53.4	Tokyo	57.04	Berlin	56.02
13	Oslo	52.52	Singapore	56.03	Oslo	55.98
14	Stockholm	52.25	Moscow	54.73	Hong Kong	55.78
15	London	51.9	Oslo	54.37	Kiev	55.5
16	Helsinki	51.27	Amsterdam	54.36	Taipei	53.76
17	Macau	48.69	Auckland	54.27	Tallinn	52.95
18	Mexico City	47.01	London	52.54	Sydney	52.2
19	Kuala Lumpur	46.16	Lisbon	51.68	Vilnius	51.75
20	Zurich	45.36	Sydney	50.08	Stockholm	51.31

remains ranked first despite relative declines in its overall scores. Madrid and Auckland show consistent increases between 2013-14 and 2018–19. New York, and Hong Kong experienced overall declines between 2013-2014 and 2018–19.

Table 6 highlight the differences and changes by continent. When examining the longitudinal results by geographic location, Oceania was highest ranked among the continents, with an average score of 59.72, significantly higher than

Table 6 Average score by continent 2003–2018-19

	Oceania	Europe	Asia	Average	North America	South America	Africa
2018–19	59.72	43.54	34.44	38.8	34.82	32.54	23.37
2015–16	52.17	43.16	33.35	36.57	35.61	29.26	24.17
2013–14	41.08	36.2	33.1	33.37	31.96	31.37	21.18
2011–12	41.85	39.95	31.85	33.76	30.99	28.44	21.06
2009	48.59	39.54	37.13	35.93	32.65	31.23	24.06
2007	47.37	37.55	33.26	33.37	33.77	28.2	16.87
2005	49.94	37.17	33.05	33.11	30.21	20.45	24.87
2003	46.01	30.23	30.38	28.49	27.42	20.25	17.66

Table 7 Average scores by OECD member and non-member countries 2003–2018-19

	OECD	Average	Non-OECD
2018–19	48.55	40.1	31.65
2015–16	48.51	36.57	30.42
2013–14	43.24	33.37	28.51
2011–12	45.45	33.76	27.52
2009	46.69	35.93	30.83
2007	45	33.37	27.46
2005	44.35	33.11	26.5
2003	36.34	28.49	24.36

Table 8 Average score of E-Government categories in OECD member and non-member countries (2018–19)

	Privacy/ Security	Usability	Content	Service	CS Engagement
OECD	11.5	16.22	12.81	10.32	6.89
Average	7.39	14.58	9.47	7.94	4.93
Non-OECD	5.34	13.77	7.8	6.75	3.96

its score of 52.17 in 2015–16. Europe ranked second with a score of 43.54, also increasing its score of 43.16 in 2015–16. North America and Asia followed in third and fourth positions with scores of 34.82 and 34.44, respectively. South America and Africa also improved from 2015 to 16 with scores of 32.54 and 23.37, respectively.

Importantly, all 100 cities selected for this survey had official websites. Only 97 had them in 2015–16. When comparing survey scores based on affiliation with the Organization for Economic Co-operation and Development (OECD), we found OECD cities scored higher than non-OECD cities. Interestingly, the gap between cities in OECD and non-OECD nations slightly decreased between 2018-19 and 2015–16, as shown in Table 7. The differences between the two groups based on categories is shown in Table 8. This indicates that non-OECD countries are making great strides in improving e-government performance relative to OECD countries. Seoul (84.07) was the highest-ranked OECD city, and Yerevan (67.59) ranked highest for the non-OECD category.

The cities overall improved their average scores in all five categories, with the highest score in Usability and the lowest in Citizen and Social Engagement. Among the five categories (Privacy/Security, Usability, Content, Services, and Citizen and Social Engagement), all improved slightly in 2018–19 as compared to 2015–16. Table 9 shows these findings.

Table 9 Average score by E-Government categories 2003–2018-19

	Privacy/ Security	Usability	Content	Service	CS engagement
2018–19	6.19	12.36	7.97	6.7	4.1
2015–16	5.55	12.38	8.22	6.82	3.87
2013–14	4.88	12.04	7.62	5.49	3.34
2011–12	4.99	12.09	7.38	5.78	3.53
2009	5.57	11.96	8.21	6.68	3.5
2007	4.49	11.95	7.58	5.8	3.55
2005	4.17	12.42	7.63	5.32	3.57
2003	2.53	11.45	6.43	4.82	3.26

Best Practices

Seoul

The city of Seoul, South Korea ranked first in the Eighth Global E-Governance Survey. Similar to the previous surveys, Seoul was the top performing city in Service Delivery, Content, and ranked second in Privacy and Security, third in Citizen and Social Engagement, and ninth in Usability. The official website presents a user-friendly interface with clear block arrangements, vibrant graphics, and a homepage of appropriate length. The website provides several features including robust search tools, attractive design, and a sitemap with interactive links that facilitate greater citizen participation online. The website also enables direct communication between the citizens and the Mayor, as well as multiple social media platforms to interact with the municipal departments.

Madrid

Madrid ranked second overall and first in Privacy and Security and Usability, and second in Service Delivery. Its top performance in Privacy and Security is a result of robust features such as its transparency portal, open data portal, new municipal organization chart, security measures, and more. The website homepage has two real-time features: a "Most Seen" link that highlights the top three trending links, and "Madrid at the Minute" which shows the current time, weather, air quality, traffic, and alternative travel route options. The website also provides several channels for engagement with public officials and enables users to subscribe for updated content on subjects that interest them.

Yerevan

The city of Yerevan, a new entrant to the top five rankings in the Global E-Government Survey, ranked third in both Privacy and Security and Service Delivery.

The website enables users to conduct several transactional services, make payments, complete applications, etc. The city also enables service requests through social media, specifically the Yerevan Municipality Facebook Page. The resident users have various channels online to engage with their government and provide feedback, such as discussion boards and online surveys and polls for specific issues that display immediate results. The website privacy policy also addresses the use of encryption and cookies, the disclosure of personal information to third parties, and the managerial measures that limit access to such data.

Auckland

The city of Auckland ranked fourth in the Global E-Governance Survey, having moved up thirteen places from the previous survey, and second in Citizen and Social Engagement. The most prominent feature on its website is "Have your say and help shape Auckland", which enables resident users to share their opinions on policies, municipal projects, and encourages them to attend council meetings, hearings, speaker sessions, etc. There is a link for the People's Panel, a public engagement forum, and there is also a specific link for Maori to contribute to the decision-making process.

Paris

The city of Paris, France completes the Top 5 Best Practices section, ranking fourth in Content and fifth in Citizen and Social Engagement. The website homepage features the "Services and Practical Information" navigation link which guides users to the most frequently requested types of content such as obtaining a national identity card or passport, parking payments, etc. The city provides an online form at the bottom of every page for users to request information from the city, and also provides real-time status information on several requests and applications. The website's most unique feature is a decision-tree infographic posted by the city's twitter account that displays specific handles to contact for each question.

Conclusion

Cities around the world use technology to create public value and better serve their visitors, residents, and citizens. This research extends our knowledge of the capacity and performance of local governments to provide information, transact services and engage in participatory e-governance. We show that Usability, Content, and Services experienced minor declines. Calista et al. (2010) suggests several potential reasons for declines in e-government performance, including regime change, volatile economic conditions, and changes in strategic priorities. The longitudinal analysis provides valuable comparative information demonstrating that e-government performance lagged in the years following the 2008 great recession before improving again in 2013–14. Future research needs to consider the impact of COVID-19 as a contextual factor in assessing the capacity of city e-government performance.

In addition, this research indicates that in the 2018–19 survey, Privacy and Security and Citizen Social Engagement experienced the greatest gains. Increases in Privacy and Security may indicate the increased risk that cybersecurity presents to municipal governments. Local governments around the world are charged with safeguarding data, but there is also an increased need to engage citizens and become more open and transparent. It is not surprising that scores for Citizen and Social Engagement increased between 2015-16 and 2018–19. This may indicate that municipal governments are transitioning from an emphasis on Web 1.0 to Web 2.0 applications. Rogers (2003) asserts that new technology is adopted along an s-curve where the adoption of innovation is slow initially, followed by rapid growth that eventually levels off as the innovation matures. Melitski and Calista (2016) further state that e-government capacity improves at a rate consistent with others technological innovations. As e-government transitions from Web 1.0 to Web 2.0, it is not unreasonable to expect a similar period of moderate adoption, followed by accelerated growth before plateauing.

Lastly, the gap between OECD and non-OECD nations decreased between 2015-16 and 2018–19, indicating greater equity between OECD and non-OECD nations. This is consistent with previous research following the 2008 financial crisis among developed nations (Calista & Melitski, 2011). Overall, e-government capacity is growing, but not at rates previously experienced, particularly among developed nations. Despite a few declines, overall scores increased between 2015-16 and 2018–19. Future research needs to continue evaluating e-government capacity and performance. In particular, we should examine the effects of COVID-19, and the shift towards improving privacy, security, transparency, and citizen engagement.

Appendix 1 Cities and Websites

City	Country	Website
Addis Ababa	Ethiopia	www.addisababacity.gov.et/
Algiers	Algeria	www.wilaya-alger.dz
Almaty	Kazakhstan	www.almaty.gov.kz/
Amman	Jordan	www.ammancity.gov.jo/
Amsterdam	Netherlands	www.iamsterdam.com
Athens	Greece	www.cityofathens.gr
Auckland	New Zealand	www.aucklandcouncil.govt.nz
Baku	Azerbaijan	www.baku-ih.gov.az/
Bangkok	Thailand	www.bangkok.go.th
Beirut	Lebanon	www.beirut.gov.lb/
Belgrade	Serbia	www.novibeograd.rs/
Berlin	Germany	www.berlin.de
Bishkek	Kyrgyzstan	www.meria.kg/
Bogota	Colombia	www.bogota.gov.co
Bratislava	Slovakia	www.bratislava.sk/

City	Country	Website
Brussels	Belgium	www.be.brussels
Bucharest	Romania	www1.pmb.ro
Budapest	Hungary	www.budapest.hu/
Buenos Aires	Argentina	www.buenosaires.gob.ar
Cairo	Egypt	www.cairo.gov.eg
Caracas	Venezuela	www.caracas.gov.ve
Casablanca	Morocco	www.casablancacity.ma
Chisinau	Moldova	www.chisinau.md/
Colombo	Sri Lanka	www.cmc.lk/
Copenhagen	Denmark	www.kk.dk/
Damascus	Syria	www.damascus.gov.sy/
Dhaka	Bangladesh	www.dncc.gov.bd (North Dhaka) & www.dhakasouthcity.gov.bd (South Dhaka)
Doha	Qatar	www.baladiya.gov.qa
Dubai	United Arab Emirates	www.dm.gov.ae/
Dublin	Ireland	www.dublincity.ie/
Gaza	Palestine	www.gaza-city.org/
Guatemala City	Guatemala	www.muniguate.com/
Guayaquil	Ecuador	www.guayaquil.gob.ec/
Helsinki	Finland	https://www.hel.fi/www/helsinki/en
Ho Chi Minh City	Vietnam	www.hochiminhcity.gov.vn
Hong Kong	Hong Kong, China	www.gov.hk/
Istanbul	Turkey	www.ibb.gov.tr
Jakarta	Indonesia	www.jakarta.go.id/
Jerusalem	Israel	www.jerusalem.muni.il
Johannesburg	South Africa	www.joburg.org.za/
Karachi	Pakistan	www.kmc.gos.pk/
Kathmandu	Nepal	www.kathmandu.gov.np
Kiev	Ukraine	www.kyiv-obl.gov.ua
Kuala Lumpur	Malaysia	www.dbkl.gov.my
Lima	Peru	www.munlima.gob.pe/
Lisbon	Portugal	www.cm-lisboa.pt
Ljubljana	Slovenia	www.ljubljana.si/
London	United Kingdom	www.london.gov.uk
Luxembourg City	Luxembourg	www.vdl.lu/
Madrid	Spain	www.madrid.es
Manama	Bahrain	www.capital.gov.bh/
Manila	Philippines	www.manila.gov.ph
Mexico City	Mexico	www.cdmx.gob.mx
Minsk	Belarus	www.minsk.gov.by/ru/
Montevideo	Uruguay	www.montevideo.gub.uy
Moscow	Russia	www.mos.ru

City	Country	Website
Muscat	Oman	www.mm.gov.om/
New Delhi	India	www.delhi.gov.in/
New York City	United States	www1.nyc.gov
Nicosia	Cyprus	www.nicosia.org.cy
Oslo	Norway	www.oslo.kommune.no/
Panama City	Panama	www.mupa.gob.pa
Paris	France	www.paris.fr
Port Louis	Mauritius	www.mpl.intnet.mu/
Prague	Czech Republic	www.prague.eu/en
Riga	Latvia	www.riga.lv
Riyadh	Saudi Arabia	www.arriyadh.com/
Rome	Italy	www.comune.roma.it
San Fernando	Trinidad and Tobago	www.localgov.gov.tt/
San Jose	Costa Rica	www.msj.go.cr
San Juan	Puerto Rico	www.sanjuanciudadpatria.com/
San Salvador	El Salvador	www.sansalvador.gob.sv/
Sana'a	Yemen	www.sanaacity.com
Santiago	Chile	www.gobiernosantiago.cl/
Santo Domingo	Dominican Rep.	www.adn.gob.do/
Sao Paulo	Brazil	www.saopaulo.sp.gov.br
Sarajevo	Bosnia and Herzegovina	www.banjaluka.rs.ba
Seoul	South Korea	www.seoul.go.kr
Shanghai	China	www.shanghai.gov.cn
Singapore	Singapore	www.gov.sg/
Skopje	Macedonia	www.skopje.gov.mk/
Sofia	Bulgaria	www.sofia.bg/
Stockholm	Sweden	www.stockholm.se
Sydney	Australia	www.cityofsydney.nsw.gov.au
Taipei	Taiwan	www.ntpc.gov.tw/
Tallinn	Estonia	www.tallinn.ee/
Tashkent	Uzbekistan	www.tashkent.uz/
Tbilisi	Georgia	www.tbilisi.gov.ge/
Tehran	Iran	www.tehran.ir
Tirana	Albania	www.tirana.gov.al
Tokyo	Japan	www.metro.tokyo.jp/
Toronto	Canada	www1.toronto.ca/
Tunis	Tunisia	www.commune-tunis.gov.tn
Ulaanbaatar	Mongolia	www.ulaanbaatar.mn
Vienna	Austria	www.wien.gv.at/
Vilnius	Lithuania	www.vilnius.lt
Warsaw	Poland	www.um.warszawa.pl
Yerevan	Armenia	www.yerevan.am/am/
Zagreb	Croatia	www.zagreb.hr

City	Country	Website
Zurich	Switzerland	www.stadt-zuerich.ch

Appendix 2 Criteria by Category

Privacy/Security	
1. A privacy or security statement/policy	9. Secure server
2–3. Data Collection	10. Use of "cookies" or "Web Beacons"
4. Option to have personal information used	11. Contact or e-mail address for inquiries
5. Third party disclosures	12. Public Information through a restricted area
6. Ability to review personal data records	13. Social media policy for posting information
7. Managerial measures	14. Use of digital signatures
8. Use of encryption	–
Usability	
15. Homepage, page length	20–21. Font Color
16. Target Audience	22–24. Forms
17–18. Navigation Bar	25–28. Search tool
19. Site Map	29. Update of website
Content	
30. Information about the location of offices	41. Portal to promote open government initiative
31. Listing of external links	42. Performance Measurement Online
32. Contact Information	43. Documents, reports, or books (publications)
33. Calendar of events	44. GIS capabilities
34. Alerts and social media notification	45. Emergency Management
35. Minutes of public	46–47. Disability access
36. City code and regulations	48. Wireless technology
37. City charter and policy priority	49. Access in more than one language
38. Mission Statements	50. Job listings online
39. Budget Information	51. Human resources information
40. Documents, reports, or books (purchasing online)	52. Calendar of events
Service	
53–55. Pay utilities, taxes, fines	63–64. Bulletin board about civil applications
56. Service request on social media sites	65. FAQ
57. Online tracking system	66. Request information
58. Apply for permits	67. Customize the main city homepage
59. E-procurement	68. Access private information online
60. Property assessments	69. Purchase tickets
61. Searchable databases	70. Report violations of administrative laws and regulation
62. Complaints	–
Citizen and Social Engagement	

71–72. Comments or feedback	81. Synchronous video
73. Newsletter	82. Citizen satisfaction survey
74. Online bulletin board or chat capabilities	83. Online decision making
75–77. Online discussion forum on policy issues	84. Encouraging citizens to post on social media
78–79. Scheduled e-meetings for discussion	85. Listing of specific departments
80. Online survey/ polls	86. Real time chat or instant messaging

Declarations

References

Brown, M. M. (2007). Understanding e-government benefits: An examination of leading-edge local governments. *The American Review of Public Administration, 37*(2), 178–197.

Calista, D. J., & Melitski, J. (2007). E-government and e-governance: Converging constructs of public sector information and communications technologies. *Public Administration Quarterly*, 87–120.

Calista, D. J., & Melitski, J. (2011). Worldwide municipality websites between 2005 and 2007: An OCED perspective that compares maturational and curvilinear best practices explanations. *Public Administration Quarterly*, 268-306.

Calista, D. J., Melitski, J., Holzer, M., & Manoharan, A. (2010). Digitized government in worldwide municipalities between 2003 and 2007. *International Journal of Public Administration, 33*(12–13), 588–600.

Gil-García, J. R. (2006). Enacting state websites: A mixed method study exploring e-government success in multi-organizational settings. In *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06)* (Vol. 4, pp. 76b-76b). IEEE.

Hansson, K., Belkacem, K., & Ekenberg, L. (2015). Open government and democracy a research review. *Social Science Computer Review, 33*(5), 540–555.

Heeks, R. (2003). Most eGovernment-for-development projects fail: How can risks be reduced? iGovernment working paper no. 14, available at SSRN: https://ssrn.com/abstract=3540052 or 10.2139/ssrn.3540052.

Holzer, M., & Manoharan, A. (2016). *Digital governance in municipalities worldwide*. N.p.: National Center for Public Performance.

Kelly, G., Mulgan, G., & Muers, S. (2002). *Creating public value: An analytical framework for public service reform*. Strategy Unit, Cabinet Office.

Layne, K., & Lee, J. (2001). Developing fully functional E-government: A four stage model. *Government Information Quarterly, 18*(2), 122–136.

Linders, D. (2012). *From e-government to we-government: Defining a typology for citizen coproduction in the age of social media*. Government Information.

MacLean, D., & Titah, R. (2021). A systematic literature review of empirical research on the impacts of E-government: A public value perspective. *Public Administration Review*.

Mainka, A., Hartmann, S., Stock, W. G., & Peters, I. (2015). Looking for friends and followers: A global investigation of governmental social media use. *Transforming Government: People, Process and Policy, 9*(2), 237–254.

Manoharan, A. (2013). A study of the determinants of county e-government in the United States. *The American Review of Public Administration*, *43*(2), 159–178.

Manoharan, A. P., & Melitski, J. (2019). Introduction to E-government. *E-Government and Information Technology Management: Concepts and Best Practices*, 1.

Manoharan, A. P., & Mossey, S. (2019). CITIZEN PARTICIPATION. *E-Government and Information Technology Management: Concepts and Best Practices*, 98.

Melitski, J., & Calista, D. (2016). E-government and E-governance best practices in cities and countries compared between 2003 and 2012: Fad or diffused innovation?. *Public Administration Quarterly*, 913-948.

Milakovich, M. E. (2010). The internet and increased citizen participation in government. *JeDEM-eJournal of eDemocracy and open government*, *2*(1), 1–9. Carnegie Mellon University, .

Moon, M. J. (2002). The evolution of e-government among municipalities: Rhetoric or reality? *Public Administration Review, 62*(4), 424–433.

Moon, M. J. (2018). Evolution of co-production in the information age: Crowdsourcing as a model of web-based co-production in Korea. *Policy and Society, 37*(3), 294–309.

Nabatchi, T. (2018). Public values frames in administration and governance. *Perspectives on Public Management and Governance, 1*(1), 59–72.

Panagiotopoulos, P., Klievink, B., & Cordella, A. (2019). Public value creation in digital government. *Government Information Quarterly, 36*(4).

Rogers, E. M. (2003). Diffusion of innovations, 5th edition. In *Originally published 1965*. Schuster.

Zheng, Y., & Manoharan, A. P. (2016). The influence of government capacity on e-services diffusion at municipal level in New Jersey. *International Journal of Public Administration in the Digital Age (IJPADA), 3*(4), 1–9.