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Assessing the performance: e-government in public services in Semarang

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e-government, pagespeed insight analysis, public service, website performance **Abstract:** The adoption of technology in public services is currently one of the efforts to increase public service satisfaction. One of the supporting factors for the public to have a high level of satisfaction is the speed of the government website. However, the implementation of digital transformation in public services in Semarang City is still not optimal. The purpose of writing this article is to measure the functionality of the website using the Pagespeed analysis method and the readiness of the government to utilise technology in its public services. This measurement considers website performance, website accessibility, data updates, and website optimisation. From the results of Pagespeed analysis, it is found that the overall performance of digital-based public services needs to be developed in general to reach better, and the readiness of the government in running digital-based public services, especially in each sub-district in serving the community, is not optimal. There is a need for a comprehensive evaluation of public services policy on the sub-district website in Semarang City, and this research can be used as a reference for further research in evaluating the performance of e-government in the government.

1. Introduction

Current technological developments have greatly influenced the government sector, especially in the implementation of public services. Digital-based public services are now known as e-government or electronic Government, which is the use of information technology by government institutions to improve the quality of services to the community, and business actors and facilitate cooperation in various other fields (Handayani et al., 2022; Luthfi et al., 2023).

The Indonesian government has been innovating the implementation of e-government. It began with Law No. 14 of 2008 concerning Public Information Disclosure which encouraged the government to provide online access to information, including through the e-Gov portal. This regulation has been completed by Law No. 11 of 2008 concerning Information and Electronic Transactions as the first legal basis that regulates the use of information technology in government and society. It also regulates the recognition of electronic documents, electronic transactions, and electronic systems.

Then, Presidential Regulation Number 95 of 2018 concerning Electronic-Based Government Systems also became the main framework for implementing e-Government which emphasized an integration of digital services, efficiency, interoperability between systems, and information security. It includes policies, architecture, audits, and the SPBE maturity index. Also, there is a Presidential Regulation No. 39 of 2019 concerning One Data Indonesia which aims to support data integration between agencies and ensures government data is more open, accurate, and integrated. It is closely related to the implementation of e-Government because it encourages data interoperability (Chairunnisa et al., 2023; Nabilah et al., 2022).

Finally, Regulation of the Minister of Administrative and Bureaucratic Reform No. 59 of 2020 concerning SPBE Monitoring and Evaluation mentioned about periodic evaluation of electronic systems implementation in central and regional agencies and produces the SPBE Index (which measures the maturity and digital readiness of government agencies). In addition, Permenkominfo No. 5 of 2020 concerning Private and Public Electronic System Organizers aimed to obligate the electronic system organizers (including the government) in terms of registration, security, and data protection (Anugrah et al., 2023; Awaludin, 2019; Islami, 2021)

However, even though the government is making efforts to accelerate the development of an electronic-based system, there is still a problem with the implementation of the system in Indonesia (Nugraha, 2018). Study from (Novianty, 2013) indicated that there are differences in the level of web metrics (number of internet accesses) for local governments in Java and outside Java. From their studies, evaluating local government websites indicated that those in Java generally outperform their counterparts outside Java in terms of web metrics. Specifically, the average ranking for city government websites in Java was 51.71, compared to 38.00 for those outside Java. Further research supports these findings, showing that local government websites in Java tend to have higher quality scores. For instance, the average total score for website quality in Java was 3.27, while outside Java it was 3.13 (Garret et al., 2016).

The data shows that local governments, especially in Java, utilize websites more to disseminate information effectively to the public, while local governments outside Java show the opposite results. E-government is the use of digital technologies by public institutions to deliver services, engage citizens, and enhance governance, in which multiple actors including government agencies, civil society, the private sector, academia, and citizens actively participate in shaping its design, implementation, and evaluation (Cordella & Hesse, 2015). This definition emphasized the importance of the implementation of e-government and its urgency to improve public trust in the government (Glyptis et al., 2020). The impact of implementing e-government is to provide opportunities for the community to be actively involved in decision-making (Putra et al., 2024).

In addition to having the benefits of supporting effectiveness and efficiency in public services, the implementation of e-government also has positive impacts such as reducing operational costs, supporting economic development, strengthening transparency and accountability, improving services for the community, improving functions between government institutions, and optimizing community empowerment (Abualese et al., 2019; Juratli, 2021; Kaur & Mehta, 2017; NAZ, 2009; Ramazanovna, 2023; Wadesango et al., 2023).

Internet users in Indonesia from 2013 to 2023 have experienced an average increase trend of 9.79% per year. This is one of the positive trends in the process of digitalization of information. The digital transformation process by the government is also applied, especially to the Semarang City Government in implementing e-government. Where the implementation of the Semarang City government almost entirely supports digital public services, which has a total of 247 applications (I Setiawan, 2022) but the level of community participation in its use is considered still low (Nawawi et al., 2019).

2. Literature Review

The utilization of technology within the governmental sphere is directed toward delivering accurate information in an endeavor to improve services for the populace, thereby elevating transparency, efficacy, and responsibility in the governance of the state (Yusuf et al., 2021). E-Government is the term for when governmental organizations use information and communication technology (ICT) to carry out their governance duties and provide public services (Verkijika & De Wet, 2018). Examples of governance duties and public services can be seen in the table below.

Country	Governance Duty	Public Services Provided			
Sweden	Welfare state management	Universal healthcare, free education (including university), child care subsidies			
Singapore	Smart governance and plan- ning	E-services via MyGov portal, digital identity (Singpass), ef- ficient transport system			
Germany	Federal-local coordination	Local governments manage schools, roads; national level handles defense and pensions			
Japan	Aging population services	Elderly care insurance, public health outreach, robotic as- sistance in elderly care			
Brazil	Urban governance in megaci- ties	Bolsa Família (cash transfers), sanitation programs, health clinics in favelas			
Kenya	Decentralization for equity	Huduma Centres (one-stop e-government services), rural electrification, education access			
Indonesia	Digital transformation & de- centralization	SPBE (e-Gov), village fund program, online licensing (OSS), school operational aid (BOS)			
Canada	Multicultural inclusion & trans- parency	Multilingual public services, open data portals, Indigenous services reform			
India	Scale-up of basic services in rural areas	Aadhaar digital ID, e-governance (Digital India), public distribution system (PDS)			
Netherlands	E-participation and sustainable planning	Online consultations, sustainable urban mobility, eHealth initiatives			

Table 1. Governance and public services

Sources: (Batley et al., 2012; Williamson, 2014)

The table above shows that the implementation of good governance in the system of e-government requires bureaucratic support, sufficient finances, employee skills in operationalizing IT, sufficient infrastructure, good leadership, effective organizational design, and an adaptive work culture (Apriliyanti et al., 2021). Those can be achieved if the speed of government websites plays a crucial role in supporting e-government initiatives (Ramazanovna, 2023). Faster websites contribute to enhancing e-government service delivery, improving user experience, and increasing citizen involvement. Studies have shown that the efficiency of completing tasks, the accuracy and completeness of achieving goals, user satisfaction, and understandability are key parameters affected by website speed. Moreover, there is a strong positive relationship between the perceived usability and credibility of government websites, highlighting the importance of fast and efficient websites in building trust and credibility with users (Al-Sakran & Alsudairi, 2021).

In previous research, the analysis of Pagespeed Insight has been employed to examine and evaluate the dimensions of a website as well as the loading times of websites using various online application (Al-Sakran & Alsudairi, 2021). A website's functionality and quality have a significant impact on how the general public views and feels about the institutions it represents. Websites with superior performance standards and excellent quality likely to make a better social impact. Pagespeed analysis have more statistically significant correlations among the performance measurement of the website speed where the Pagespeed score is the percentage of Pagespeed recommendations that a website can fulfill.

3. Research Methods

This article used the Automated Usability Testing tools method on 16 Sub-district websites in the Semarang City Government. The Automated Usability Testing tools method was chosen because it has high-accuracy measurement capabilities. The testing tools utilize Pagespeed Insights to measure and assess website performance.

No	Sub-district	Code	Domain
1	Banyumanik	BM	https://kecbanyumanik.semarangkota.go.id/
2	Genuk	GN	https://kecgenuk.semarangkota.go.id/en
3	Gajahmungkur	GM	https://kecgajahmungkur.semarangkota.go.id/
4	Semarang Barat	SB	https://kecsmgbarat.semarangkota.go.id/
5	Tembalang	ТВ	https://kectembalang.semarangkota.go.id/
6	Semarang Timur	ST	https://kecsmgtimur.semarangkota.go.id/
7	Mijen	MJ	https://kecmijen.semarangkota.go.id/
8	Pedurungan	PD	https://kecpedurungan.semarangkota.go.id/
9	Semarang Selatan	SS	https://kecsmgselatan.semarangkota.go.id/
10	Candisari	CS	https://keccandisari.semarangkota.go.id/
11	Gayamsari	GY	https://kecgayamsari.semarangkota.go.id/en
12	Gunungpati	GP	https://kecgunungpati.semarangkota.go.id/profil-kecamatan
13	Ngaliyan	NG	https://kecngaliyan.semarangkota.go.id/profil-kecamatan
14	Semarang Tengah	ST	https://kecsmgtengah.semarangkota.go.id/profil
15	Semarang Utara	SU	https://kecsmgutara.semarangkota.go.id/
16	Tugu	TG	https://kectugu.semarangkota.go.id/

Table 2. List of URL of sub-districts in Semarang

The initial stage in website performance analysis determines the sub-district web page and embeds the website page in https://pagespeed.web.dev/ Data is processed from access tests through overall mobile and desktop application simulations, Large Contentful Paint (LCP), First Input Delay (FID), and CumulativeLayout Shift (CLS) values. The LCP or Large Contentful Paint value is a metric for measuring the rendering time of the largest image or text block that can be seen. FID or First Input Delay is a metric for measuring the period between the user and the response from the application. CLS or Cumulative Layout Shift measures the total layout changes when the user enters a web page.

4. Results and Discussion

Implementation of digital-based public services in Semarang

The use of technology in the government process, known as e-government, is a form of modernization in improving public services not only at the central level but also at the regional level. Semarang is one of the 10 cities with the highest SPBE (Electronic Based Government System) index in Indonesia (PANRB, 2024).

In addition, e-government also aims to support good governance so that people can easily obtain information and can also reduce the potential for corruption through increased transparency, accountability of public institutions and expanding opportunities for the public to be directly involved in decisions or policy-making by the government. The sub-district is part of the administrative unit of government in each city and occupies a very strategic position in offering services. These services include health, education, population affairs, and licensing recommendations within the sub-district. Currently, 16 sub-districts in Semarang City have utilized websites to improve public services. Semarang City has implemented the smart city concept since 2013, which has slowly led to various innovations, one of which is the sub-district website.

No	Code	Domain	Newest Publication	
1	BM	https://kecbanyumanik.semarangkota.go.id/	31 Juli 2024	
2	GN	https://kecgenuk.semarangkota.go.id/en	10 Juli 2024	
3	GM	https://kecgajahmungkur.semarangkota.go.id/	31 Juli 2024	
4	SB	https://kecsmgbarat.semarangkota.go.id/	31 Juli 2024	
5	ТВ	https://kectembalang.semarangkota.go.id/	05 Mei 2024	
6	ST	https://kecsmgtimur.semarangkota.go.id/	N/A	
7	MJ	https://kecmijen.semarangkota.go.id/	31 Juli 2024	
8	PD	https://kecpedurungan.semarangkota.go.id/	N/A	
9	SS	https://kecsmgselatan.semarangkota.go.id/	23 Agustus 2023	
10	CS	https://keccandisari.semarangkota.go.id/	13 Mei 2024	
11	GY	https://kecgayamsari.semarangkota.go.id/en	19 November 2023	
12	GP	https://kecgunungpati.semarangkota.go.id/profil-kecamatan	1 Juli 2024	
13	NG	https://kecngaliyan.semarangkota.go.id/profil-kecamatan	22 November 2023	
14	ST	https://kecsmgtengah.semarangkota.go.id/profil	21 Agustus 2023	
15	SU	https://kecsmgutara.semarangkota.go.id/	03 November 2023	
16	TG	https://kectugu.semarangkota.go.id/	30 Juli 2024	

Table 3. Domain e-government public service in Semarang

Source: Processed by the author and accessed on July 31, 2024.

The implementation of e-government is often seen in the availability and quality of websites provided. The website is considered to be cheaper and easier to reach the general public widely through the internet network without any time limitations. The implementation of digital utilization in public services is carried out concerning Presidential Instruction No. 3 Year 2003 on National Policy and Strategy for e-Government Development. According to research conducted by Yunita and Aprianto (2018), website evaluation is needed to assess the development of e-government in Indonesia. Based on the measurement results, it is known that of the four stages at the level of e-Government development, namely preparation, maturation, stabilization, and utilization Semarang City occupies the Utilization stage in the implementation of e-Government.

However, when viewed from the digital readiness (e-Readiness) in the use of technology in public services in the assessment of the organizational domain in the sub-districts in Semarang City, it was found that human resources in services at the sub-district level were still often found to be incompatible with ICT skills on the job so that e-government-based services were not optimal (Putra & Sajida, 2023; Susanto et al., 2023). On the other hand, the application provided by the Semarang City government is also very limited, and can only be accessed by Android users.

The sub-districts in Semarang City have all been supported by the use of e-Government so that the public can access it in real-time, but there are still obstacles in its development such as information updates made by the government are not regular (See Table 3).

Pagespeed insight analysis

The performance of a local government website was simulated on mobile and desktop devices. The application allows users to perform measurement experiments by observing the guidelines to determine a score from 0-100 that estimates the overall performance of the web page.

A score is categorized as poor when it gets a score of (0-49) so that it requires major improvements to improve the optimization of website performance, a moderate score if a website gets a score of (59-89) so that it needs to optimize performance in general. A good score (90-100) if the web page can run well and only requires minor improvements. Good website performance ideally has an impact on the best user experience. Website visitors expect sites to display quickly, be navigation-friendly, and deliver relevant information efficiently. M. Campoverde-Molina, S. Luján-Mora, and L. Valverde, "Evaluation of the Accessibility of the Homepages of the Web.

Website performance is the initial part tested through page speed insight, generally weighted based on the speed index on a website. Based on the data obtained through mobile or desktop simulations, the best performance for the platform used via mobile phone is Gunungpati Sub-district, while if accessed via desktop, the best performance is achieved by the web performance of Tugu Sub-district.





To provide users with the best possible online browsing experience; websites should display promptly and follow standards and recommendations when developing them to ensure good quality.

The second test tested the accessibility aspect of website performance across all sub-districts in Semarang City. Several weightings affect the level of accessibility on a website so it affects the assessment for example, many displays can affect the accessibility test so that any information in various services displayed on the button can be accessed by users so that users can get clarity of information. Based on the data processed, most of the sub-district websites in Semarang City have provided information to users. It is found that the website with the highest level of accessibility in West Semarang Sub-district both in the simulation test on mobile phone and desktop users.



Table 5. Accessibility measurement on sub-district website

Website development and data updating is an important part of best practice measurement. In general, website development and data updates are an important part of best practice measurement. In general, the guidelines that are often mentioned to make the website more optimal pay attention to the accuracy of coding, image ratio, and website security guarantees. Table 6 shows that the Ngaliyan sub-district website scored the highest on both mobile phone and desktop simulations.

However, in general, the overall best practice in Semarang City is still lacking and needs to be improved to have the same quality in providing ease of publicizing services mentioned to make the website more optimal, paying attention to the accuracy of coding, image ratio, and website security guarantees. Table 6 shows that the Ngaliyan sub-district website scored the highest on both mobile phone and desktop simulations. However, the overall best practice in Semarang City is still lacking and needs to be improved to have the same quality in providing easy public services.





Search engine optimization (SEO) serves as a conduit for directing the necessary traffic towards the attainment of fundamental business objectives such as conversions, visits, and sales. Furthermore, it fosters credibility; a website that attains a high ranking is typically perceived as authoritative and reliable, qualities that Google prioritizes in order to enhance its rankings.

Based on the data processing, the researchers found that almost all sub-district websites in Semarang City fulfil the SEO assessment so that they can be easily searched with certain keywords in search engines such as Google, Yahoo, and Bing.



Table 7. SEO measurement on sub-district website

5. Conclusion

This study highlights the varied performance of sub-district websites in Semarang City through an evaluation using PageSpeed Insights and other key digital performance indicators. While some districts such as Gunungpati and Tugu show promising results in mobile and desktop simulations respectively, most websites fall into a moderate performance range and require general optimization. Despite the presence of digital platforms across all 16 sub-districts, the analysis reveals gaps in digital readiness, especially in terms of human resource capacity and accessibility features. Certain websites are not updated regularly or have platform limitations, which hinders their overall functionality and user engagement.

Furthermore, while a few sub-districts, like Ngaliyan and West Semarang, demonstrate strength in best practices and accessibility, inconsistencies persist in coding standards, user experience, and information clarity across the board. Encouragingly, most sites meet SEO standards, aiding visibility and public access. However, despite Semarang's inclusion in the smart city initiative and a strong national SPBE index, the full potential of e-government at the sub-district level remains untapped. To move forward, strategic improvements are needed—such as better content management, regular updates, improved system accessibility, and capacity building for staff. A more integrated and standardized digital strategy will be key to optimizing public service delivery through these platforms.

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