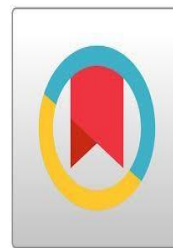


## Trends and Challenges of Digital Transformation in the Public Sector: Policy Implications for Improving Public Services in Indonesian



### Tren dan Tantangan Transformasi Digital di Sektor Publik: Implikasi Kebijakan untuk Meningkatkan Pelayanan Publik di Indonesia

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#### ARTICLE INFORMATION

##### Keywords

Digital  
Transformation;  
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Public Policy;  
Digital Divide  
Technology;  
Infrastructure;

##### ABSTRACT

This research explores trends, challenges and innovations in digital transformation in the public sector, with a focus on its implications in Indonesia. The objectives of this study are to evaluate operational efficiency improvements in public services generated by digital transformation, identify challenges in the implementation of digital technologies, and provide policy recommendations to ensure the sustainability of technology adoption in the Indonesian public sector. The methodology used included a literature review and data analysis from the Scopus database, which was analyzed using VOSviewer to identify key patterns and trends in digital technology adoption in the public sector. The results show that the success of digital transformation depends not only on the adoption of new technologies, but also requires structural changes and organizational culture. Key challenges include resistance to change, the digital divide between urban and rural areas, and infrastructure limitations. This research provides policy recommendations that can accelerate the adoption of digital technologies in Indonesia, particularly through cross-sector collaboration and infrastructure improvements. The findings are expected to serve as a reference for policymakers and practitioners to strengthen the digitalization of public services in a sustainable manner. This research still has several limitations, such as the absence of field studies that directly test the effectiveness of digital transformation in the public sector, as well as analysis of regulations and human resource readiness that still need to be deepened. In addition, the mapping of digitalization trends in Indonesia is still limited to secondary data. For this reason, future research is recommended to conduct surveys or direct interviews with policy makers, strengthen policy analysis, and compare the implementation of digital transformation in other countries so that the strategies formulated are more appropriate and contextual for Indonesia.

##### Kata Kunci

Transformasi Digital;  
Sektor Publik;

##### ABSTRAK

Penelitian ini mengeksplorasi tren, tantangan, dan inovasi dalam transformasi digital di sektor publik, dengan fokus pada implikasinya di Indonesia. Tujuan

|                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Kebijakan Publik;<br/>Kesenjangan Digital;<br/>Infrastruktur Teknologi;</p>                                                                        | <p>dari penelitian ini adalah untuk mengevaluasi peningkatan efisiensi operasional dalam pelayanan publik yang dihasilkan oleh transformasi digital, mengidentifikasi tantangan dalam implementasi teknologi digital, dan memberikan rekomendasi kebijakan untuk memastikan keberlanjutan adopsi teknologi di sektor publik Indonesia. Metodologi yang digunakan meliputi tinjauan literatur dan analisis data dari database Scopus, yang dianalisis menggunakan VOSviewer untuk mengidentifikasi pola dan tren utama dalam adopsi teknologi digital di sektor publik. Hasil penelitian menunjukkan bahwa keberhasilan transformasi digital tidak hanya bergantung pada adopsi teknologi baru, tetapi juga membutuhkan perubahan struktural dan budaya organisasi. Tantangan utama yang dihadapi antara lain resistensi terhadap perubahan, kesenjangan digital antara daerah perkotaan dan pedesaan, serta keterbatasan infrastruktur. Penelitian ini memberikan rekomendasi kebijakan yang dapat mempercepat adopsi teknologi digital di Indonesia, terutama melalui kolaborasi lintas sektor dan perbaikan infrastruktur. Temuan-temuan penelitian ini diharapkan dapat menjadi referensi bagi para pembuat kebijakan dan praktisi untuk memperkuat digitalisasi layanan publik secara berkelanjutan. Penelitian ini masih memiliki beberapa keterbatasan, seperti belum adanya studi lapangan yang secara langsung menguji efektivitas transformasi digital di sektor publik, serta analisis regulasi dan kesiapan sumber daya manusia yang masih perlu diperdalam. Selain itu, pemetaan tren digitalisasi di Indonesia masih terbatas pada data sekunder. Untuk itu, penelitian selanjutnya disarankan untuk melakukan survei atau wawancara langsung dengan para pemangku kebijakan, memperkuat analisis kebijakan, dan membandingkan implementasi transformasi digital di negara lain agar strategi yang dirumuskan lebih tepat dan kontekstual untuk Indonesia.</p> |
| <p><b>Article History</b><br/>Send 14<sup>th</sup> January 2024<br/>Review 24<sup>th</sup> January 2024<br/>Accepted 7<sup>th</sup> February 2025</p> | <p>Copyright ©2025 <a href="#">Jurnal Aristo (Social, Politic, Humaniora)</a><br/>                     This is an open access article under the <a href="#">CC-BY-NC-SA</a> license.<br/>                     Akses artikel terbuka dengan model <a href="#">CC-BY-NC-SA</a> sebagai lisensinya.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |



## Introduction

The Digital transformation in the public sector has been a major focus in academic literature over the past decades, given its significant impact on institutional sustainability and public service delivery (Mergel et al., 2019). Governments in various countries continue to adopt digital technologies such as e-government, information and communication technology (ICT), and GovTech to improve transparency and accountability (Deloitte Insights, 2021; Huaytan et al., 2024). However, challenges still arise in the application of this technology, especially in terms of system integration, resistance to change, as well as differences in digital readiness in different regions. (Bajraliu & Qorraj, 2023; Li et al., 2023). While digital innovation continues to evolve, there is still a knowledge gap in understanding effective implementation across different social, geographical and cultural contexts (Hietala et al., 2023; Iyer & Kuriakose, 2024).

In Indonesia, the digital transformation of the public sector is progressing rapidly, especially through the Electronic-Based Government System (SPBE) initiative and the digitization of services in various agencies (Dečman et al., 2022; Hien et al., 2024). The government is working to expand access to technology to improve the efficiency of public administration, but challenges remain, including the digital infrastructure gap between urban and rural areas, low digital literacy of civil servants, and limited interoperability of systems between agencies (Correa-Ospina et al., 2021; Nguyen et al., 2024). In addition, the issue of data security and privacy protection is a major concern, given the increasing cyber threats that can hinder the sustainability of digital transformation (Galushi & Malatji, 2022; Zhou et al., 2024). Bureaucratic constraints and lack of regulatory readiness are also obstacles in accelerating the digitalization of public services, especially in implementing policies that are adaptive to technological developments (Saukkonen et al., 2024). Therefore, there needs to be a more systematic strategy to ensure that digitalization is not just a technical modernization, but also able to create significant structural changes in governance (Guo & Shen, 2024).

The urgency of this research lies in the pressing need to address the challenges in the implementation of digital transformation to not only improve operational efficiency, but also encourage public participation in governance and reduce opportunities for corruption through increased transparency of public administration (Agbozo & Asamoah, 2019; Mlambo, 2022). Complexity of system integration and lack of coordination between agencies are the main obstacles in implementing digital transformation in the public sector (Irani et al., 2023; Maulana et al., 2024). Resistance to change does not always come from

individuals, but often relates to aspects of policy and governance that have not been optimized (Tangi et al., 2021; László et al., 2024). In Indonesia, layers of bureaucracy and budget constraints mean that the implementation of digitalization is often slow and uneven across regions (Bonomi Savignon et al., 2024). Therefore, policy-based solutions are needed that are not only oriented towards technology adoption, but also consider the social, economic and cultural factors that influence its success (Sihombing & Lumbantobing, 2024).

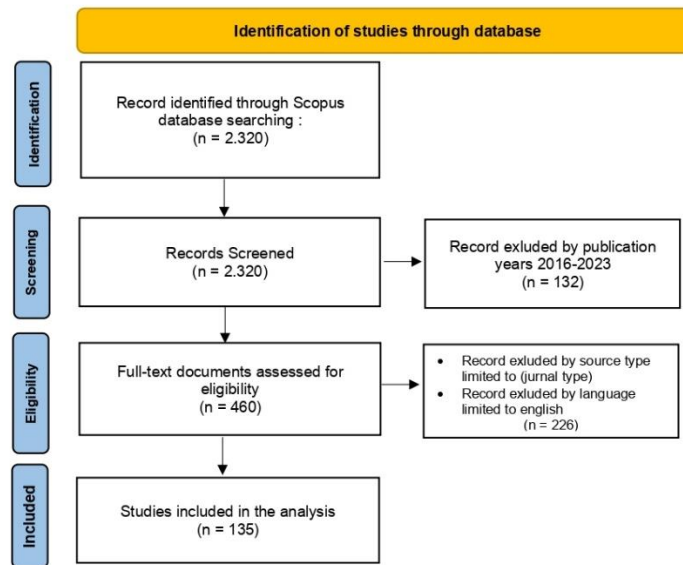
This research focuses on policy strategies that the government can adopt to accelerate digital transformation in the public sector, with an emphasis on increasing collaboration between the public and private sectors and strengthening digital skills at all levels of society (Pislaru et al., 2024). Evidence-based policy formulation that considers the local context is crucial so that digitalization is not just a momentary trend, but also a sustainable solution in improving the effectiveness and efficiency of public services (Mutiarin et al., 2024). With a more systematic approach, digital transformation can have a significant positive impact on the sustainability of governance and strengthen community involvement in public decision-making. This research provides concrete recommendations for policymakers in ensuring that digital transformation in the public sector is not only technology-oriented, but also able to address existing social and bureaucratic challenges (Vinarski-Peretz & Kidron, 2024).

## Method

This research uses a systematic literature review method approach to explore trends, challenges and innovations in digital transformation in the public sector, with a focus on the Indonesian context (Wirtz et al., 2019). The data used was obtained from scientific articles indexed in Scopus, a bibliographic database widely recognized for its comprehensive coverage of peer-reviewed literature in various fields (Schotten et al., 2017), making it an appropriate foundation for a complete literature review. The publication time span of the articles used was between 2016 and 2023. The selected articles were screened based on topic relevance and research focus, with keywords such as "digital transformation", "public sector", and "e-government".

The data obtained was then analyzed using thematic analysis to identify key themes, such as technology adoption challenges, infrastructure constraints, and public service innovation. The coding results of this analysis were categorized into themes that facilitate understanding of the patterns found in the literature. In addition, VOSviewer software was used to visualize the relationships between themes and emerging trends, as well as to explore

areas that require further exploration, such as the digital divide and technology adoption challenges in remote areas.



**Figure 1. The modified PRISMA diagram illustrates the process of selecting articles in a systematic review.**

**Sumber: (Wang et al., 2019)**

Figure 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology used to guide the data screening and selection process (Wang et al., 2019). Initially, 1,320 documents were identified, which were then filtered down to 460 documents by limiting the source type to journals, conference proceedings and book series. Further screening resulted in 226 documents by narrowing the document types to articles, conference papers, conference reviews, book chapters and reviews.

## Literatur Review

### *Application of Technology in Digital Transformation in the Public Sector*

Digital transformation in the public sector has created various technological innovations designed to improve the efficiency and quality of public services. Cloud computing allows for more efficient data storage and management, as well as reduced operational costs (Deloitte Insights, 2021; Mergel et al., 2023). In addition, big data analytics helps governments make data-driven decisions, enabling more accurate and effective policy planning (Gangneux & Joss, 2022; Ghaleb et al., 2023). Artificial intelligence (AI) is also being used to automate administrative processes, such as the use of chatbots to improve citizen interactions with government (Mergel et al., 2023; del Olmo-García et al., 2023). The

Technology-Organization-Environment (TOE) Model theory offers a useful framework for understanding how technological, organizational, and environmental factors play a role in technology adoption in the public sector (Eveland & Tornatzky, 1990). This is in line with the Diffusion of Innovation (DOI) Theory which explains how new innovations spread among public organizations and the factors that influence the adoption of such technologies (Rogers et al., 2019).

Although technologies such as AI and IoT offer many benefits, their implementation in Indonesia is still hampered by infrastructure gaps, especially in remote areas (Ibáñez-Jiménez & Palomo-Zurdo, 2024). The Internet of Things (IoT) enables real-time monitoring of infrastructure, but its implementation is often hampered by limited internet connectivity (Latupeirissa et al., 2024); Pislaru et al., 2024). In the Indonesian context, literature focusing on the impact of IoT implementation in the public sector is still limited, indicating the need for more locally relevant studies (Palos-Sánchez et al., 2023). Digital Ecosystem Theory can explain how various actors, including the government, the community, and the private sector, interact with each other to drive the success of public sector digitization (Dong et al., 2007).

### ***Organizational Transformation and Challenges in the Digital Age***

The success of digital transformation in the public sector depends not only on technology adoption, but also on structural adjustments and organizational culture (Vinarski-Peretz & Kidron, 2024; Gudmundsdottir et al., 2024). Digital skills development is essential to ensure public servants are able to utilize new technologies effectively (Debeljak & Dečman, 2022). However, in Indonesia, digital skills training is still uneven, especially in more remote areas, leading to a technology adoption gap between central and local governments (Abuzyarova et al., 2019; Bahl et al., 2023). To overcome these barriers, Change Management Theory, particularly the ADKAR model, can provide guidance on the process of change in organizations, taking into account factors such as awareness, desire, knowledge, ability, and reinforcement (Angtyan, 2019). Agile methodologies can help government organizations respond more quickly to change, although adoption is still limited due to rigid bureaucracy (Bunduchi et al., 2020). This structured approach to change enables the government to better meet the challenges of digital transformation.

Resistance to change is a major challenge in digital transformation, especially in developing countries such as Indonesia, where understanding of the long-term benefits of digitalization is still minimal (Kemal & Shah, 2023). This is exacerbated by infrastructure

limitations and mindsets that are not ready to adopt change widely (Werner & Lehan, 2023). Therefore, policies that support organizational change and intensive training are necessary to overcome these obstacles (Mariani & Bianchi, 2023). In this case, the Innovation Diffusion Theory is very relevant to understand how new technologies are gradually adopted in the public sector and what factors influence the acceptance of innovations by civil servants (Eveland & Tornatzky, 1990).

### ***Innovation in Government Digital Service Delivery***

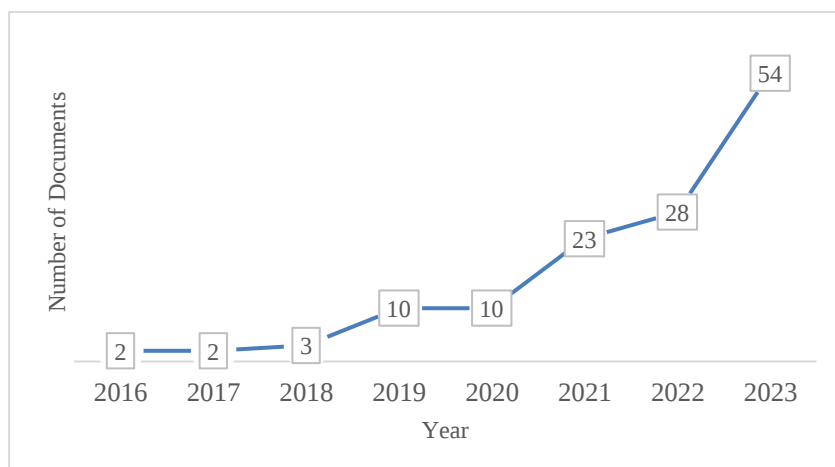
Innovations in digital service delivery by the government have facilitated interactions between citizens and the government. Digital portals and mobile applications allow citizens to access government services directly without having to visit government offices (Kristiyanto, 2016; Seo & Myeong, 2020). Chatbots are also being used to provide more responsive and personalized public services, reducing citizens' waiting time for information (Moore, 2019; Daub et al., 2020). To understand the impact of using this technology, the Theory of User Trust and Satisfaction can help explain how trust in digital services affects the level of user satisfaction, which in turn affects the successful adoption of digital services by the government (Isaeva et al., 2020).

However, the digital divide between urban and rural areas in Indonesia is still a major barrier to the equitable deployment of digital services (Onyango & Ondiek, 2023; Alves et al., 2020). Meanwhile, some major cities in Indonesia have begun to implement smart city concepts that utilize IoT and data analytics to manage infrastructure in real-time, although implementation is still in its early stages (Devlin & Coaffee, 2023). Digital collaboration between government departments has also begun to be adopted, enabling knowledge sharing through cloud-based platforms and virtual workspaces, which facilitates coordination between agencies (Girard, 2024); Nguyen et al., 2024). The Digital Ecosystem Theory is again relevant to illustrate how this collaboration strengthens the effectiveness of public service delivery in the digital era (Heidhues et al., 2024).

### **Result and Discussion**

The uploaded documents inform several important aspects of digital transformation in the public sector. There are 460 relevant English-language journal documents, with 226 documents from social science fields that focus on the social aspects of digital transformation. 135 of these documents are open access, making them more widely accessible to support inclusive research (Huo et al., 2022).

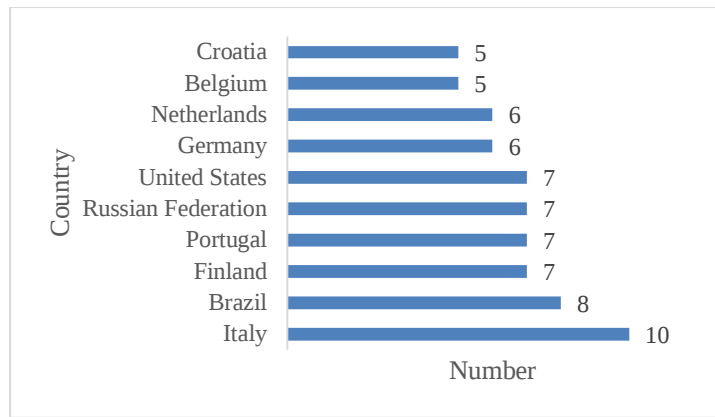
From the search results of the Scopus database, based on the year of publication, it shows a significant trend in the development of publications related to this topic (Lawelai & Nurmandi, 2024). The line diagram sourced from Scopus shows an increasing trend in the number of documents related to digital transformation in the public sector from 2016 to 2023. In 2016 and 2017, there were only 2 documents published each year, reflecting the low interest in this topic. The number of documents increased slowly to 3 in 2018 and jumped to 10 documents in 2019 and 2020, indicating a growing interest in public sector digitization. In 2021, the number of publications rose significantly to 23 documents, followed by 28 documents in 2022. The peak came in 2023, with 54 documents published, reflecting a huge surge in interest in digital transformation, especially in the last three years. This increase reflects the growing importance of digitization in public services and the adoption of new technologies in the sector (Lawelai, 2023).



**Figure 2. Documents by Year (2016-2023)**

**(Source : Scopus Database, 2024)**

Over the past decade, research on digital transformation in the public sector has grown rapidly, conducted by researchers from various countries with varying levels of quality. This has led them to publish their findings in leading Scopus-indexed journals.



**Figure 3. Documents by Country**  
(Source : Scopus Database, 2024)

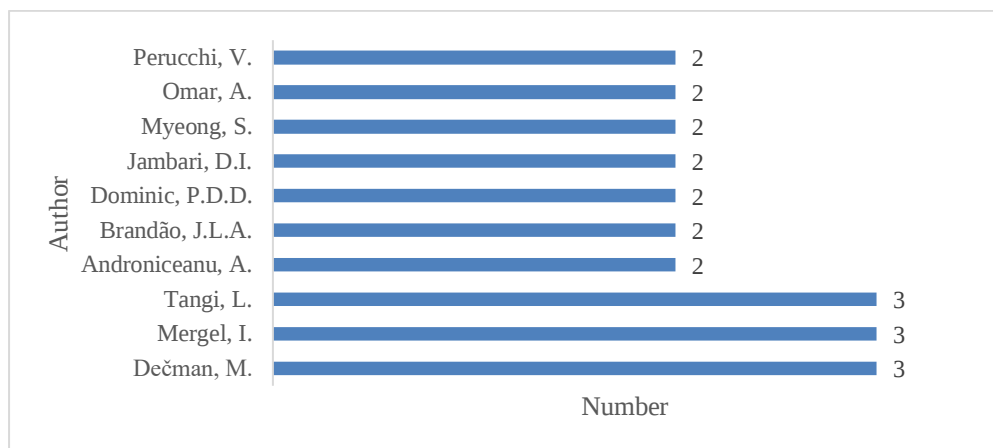
The bar chart above shows the number of publications related to digital transformation in the public sector sourced from Scopus, by country. Italy has the highest number of publications with 10 documents, followed by Brazil with 8 documents. Some other countries such as Portugal, Russia, Finland and the United States have 7 documents each. Countries such as Germany and the Netherlands have 6 documents, while Croatia and Belgium have 5 documents each. This diagram illustrates the geographical distribution of research on this topic, with Italy being the largest contributor.



**Figure 4. Documents by scientific field**  
(Source : Scopus Database, 2024)

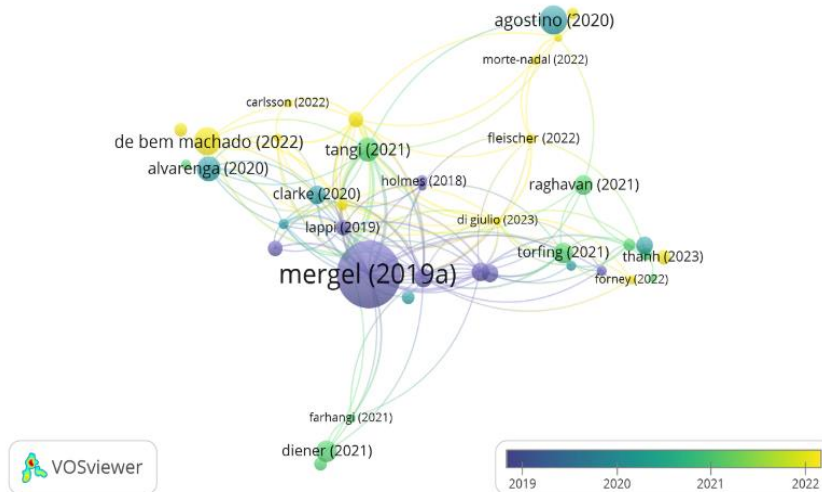
The diagram above illustrates the distribution of the number of publications from various scientific journals listed on Scopus related to the field of digital transformation in the public sector. The journal "Government Information Quarterly" emerges as the most dominant source with 8 publications, making it a major contribution to the literature on this topic. "Digital Government Research and Practice" follows with 4 publications. Other

journals such as "Ejournal Of Edemocracy And Open Government", "International Journal Of Information Management", "Public Policy And Administration", and "Transforming Government People Process And Policy" contributed 3 publications each (Borgogno & Colangelo, 2019). Meanwhile, "Administratie Si Management Public", "Big Data And Society", and "Central European Public Administration Review" each recorded 2 publications. Overall, this diagram shows that "Government Information Quarterly" is the most significant source for studies related to digital transformation in the public sector.



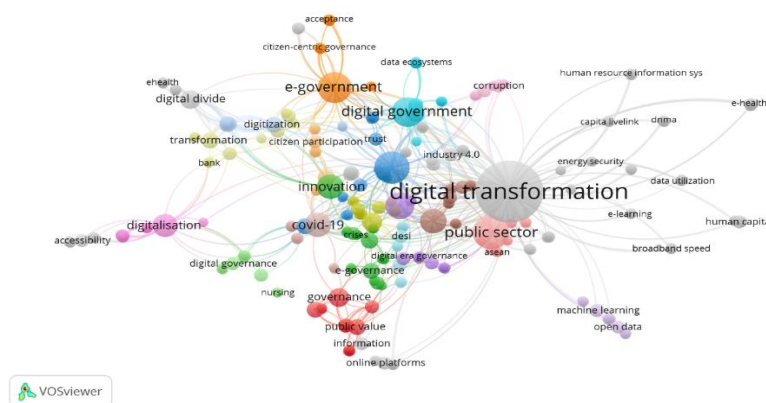
**Figure 5. Documents by Author**  
(Source : Scopus Database, 2024)

The diagram displays the number of publications from various authors whose data is sourced from Scopus, related to a specific topic. Dečman, M., Mergel, I., and Tangi, L. are the main contributors, each with 3 publications, while other authors such as Perucchi, V., Omar, A., Myeong, S., Jambari, D.I., Dominic, P.D.D., Brandão, J.L.A., and Androniceanu, A. have 2 publications each. Overall, this diagram shows that the contributions to the literature in Scopus on the topics covered are fairly evenly distributed, with Dečman, M., Mergel, I., and Tangi, L. being the most prolific authors.



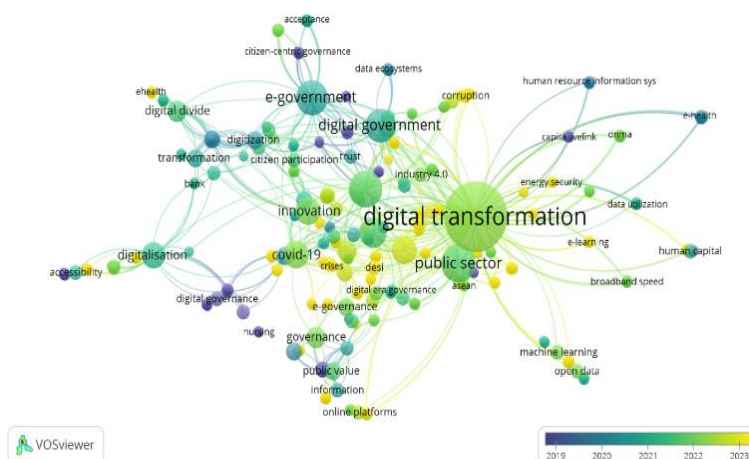
**Figure 6. Article Network Map Based on Linkage and Frequency of Occurrence**  
(Source : Data Processing Using VOSviewer, 2024)

The illustration shows a network map showing the interconnections between scientific articles based on the frequency of co-occurrence or author collaboration, with data sourced from Scopus. The largest node, "Mergel (2019a)", is the center of the network, indicating that the article is frequently cited or referenced in many related studies. The color and size of the nodes and their connecting lines reflect the temporal distribution of publications from 2019 to 2022, showing the influence and temporal relationship between articles. Other articles such as "Agostino (2020)", "Tangi (2021)", and "de Bem Machado (2022)" also contribute to this network, but with less frequency and influence. Overall, this map illustrates the interactions and knowledge networks formed between the articles in the topic.



**Figure 7. Authors Keyword Co-Accuration Network Map**  
(Source : Data Processing Using VOSviewer, 2024)

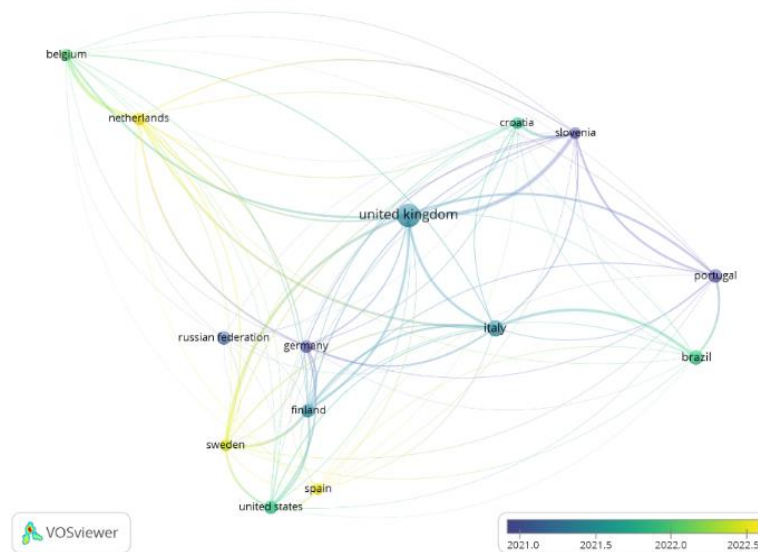
The figure displays a network map visualization created using VOSviewer, showing the interrelationships between keywords frequently used in publications related to "digital transformation" and other topics such as "e-government," "public sector," "innovation," and "covid-19" (Farhan HR & Nurmandi, 2022). Each circle (node) represents a keyword, with the size reflecting its frequency of occurrence, while the color indicates clusters of keywords that frequently co-occur. The connecting lines between the nodes show the co-occurrence relationship between the keywords, where the thicker the line, the more frequently the two keywords co-occur in the publications. Overall, this visualization illustrates the structure and focus of research in the field of digital transformation as well as the relationship between various relevant topics.



**Figure 8. Network Map Visualization of co-occurrence author keyword overlay**  
(Source : Data Processing Using VOSviewer, 2024)

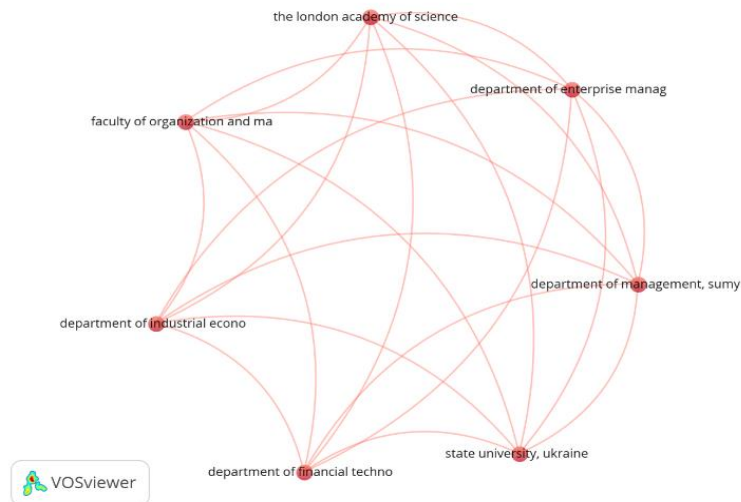
The figure displays an author keyword co-occurrence overlay visualization illustrating the relationship between frequently co-occurring keywords in scholarly publications related to "digital transformation" and other related topics, with an added time dimension showing the development of research trends over the years (Brochado et al., 2024). The color of the nodes (circles) represents the year in which the keyword was most used, with a color gradient from blue (2019) to yellow (2023), showing how the research focus has evolved over time. For example, keywords related to "covid-19" tend to appear in yellow, indicating that this is a relatively new topic, whereas older keywords such as "digital governance" and "e-government" are darker in color, indicating their popularity in previous years (Aseeva, 2024). The fixed connecting lines show the co-occurrence relationship

between the keywords, giving an idea of how these concepts are related to each other in a dynamic time context.



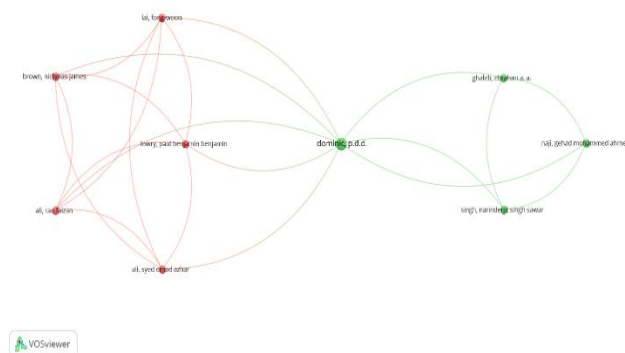
**Figure 9. Network Map of Relationships between countries**  
(Source : Data Processing Using VOSviewer, 2024)

This figure is a network visualization from VOSviewer that shows the relationship between countries based on collaboration or influence in a context, with additional time information displayed through a color scale from 2021 to 2022.5. Each dot represents a country, and the connecting lines are colored according to the period of collaboration, where blue indicates earlier collaboration and yellow indicates more recent collaboration. The United Kingdom is at the center of the network, signifying a central role in collaboration with many countries such as Croatia, Slovenia, and Italy. Countries such as Belgium and the Netherlands have strong relationships and vary in the period of collaboration, while Germany shows cross-country relationships with the Russian Federation, the United States, and Sweden. This visualization illustrates the global interactions between countries and the development of their collaboration over the analyzed time span.



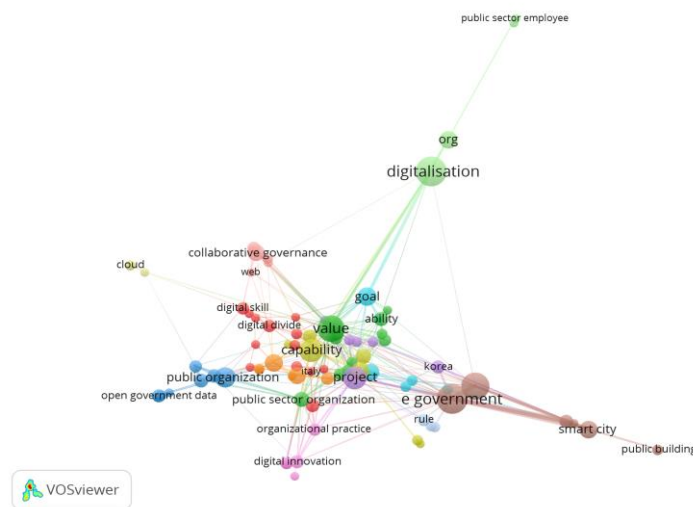
**Figure 10. Network Map Network Visualization co-authorship organization**  
(Source : Data Processing Using VOSviewer, 2024)

This visualization depicts a network of cooperation between organizations based on co-authorship in scientific publications, where each node represents an institution, such as "the London Academy of Science" or "state university, Ukraine," and the connecting lines between nodes indicate collaboration in the writing of scientific articles. The size of the nodes indicates the frequency of an organization's involvement in co-authorship, while the thickness of the lines indicates the strength or intensity of collaboration between those organizations. This visualization helps understand patterns of scientific collaboration, identify key actors in research networks, and see how knowledge and resources are transferred between institutions.



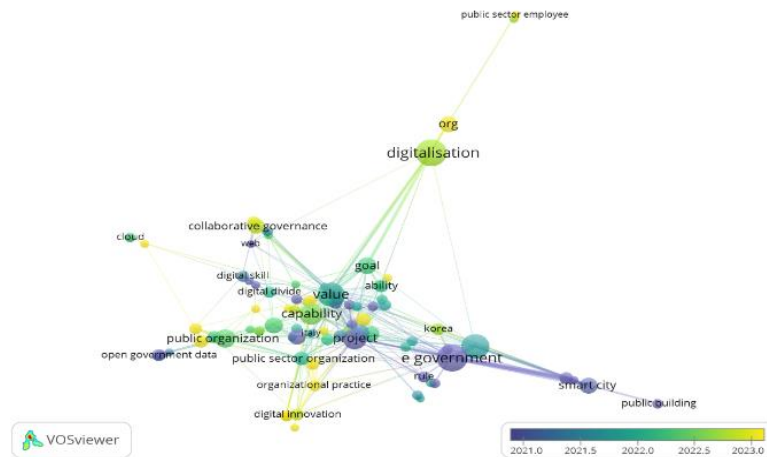
**Figure 11. Network Map Overlay Visualization of co-authorship authors**  
(Source : Data Processing Using VOSviewer, 2024)

The co-authorship overlay visualization shows the collaboration relationship between authors in a scientific publication network, where each node represents an author and the edges indicate the frequency of collaboration. Larger nodes reflect authors with larger contributions, and thicker lines indicate more frequent collaboration. The colors of the nodes and lines form clusters that reflect groups of authors who frequently collaborate, with red and green representing the two main groups. Authors like *dominic*, *p.d.d.* act as a link between the two clusters, signaling cross-group collaboration. This visualization helps identify collaboration groups and key authors that connect scientific communities.



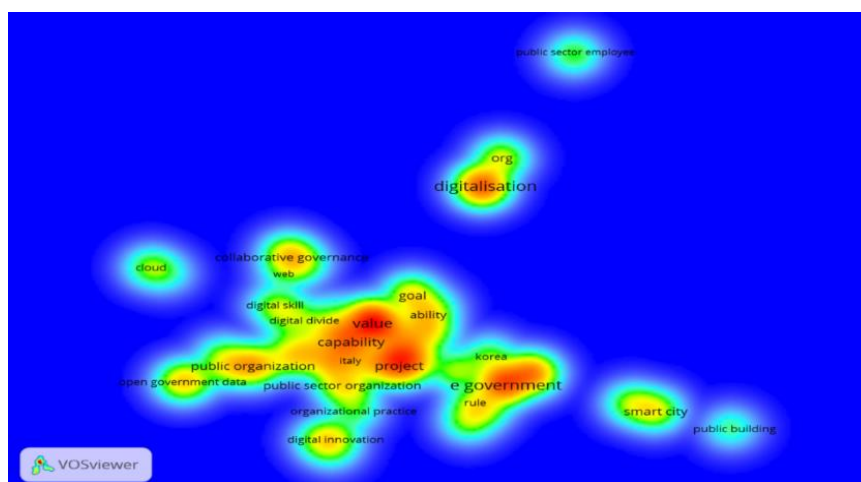
**Figure 12. Network Visualization Network Map**  
(Source : Data Processing Using VOSviewer, 2024)

The figure shows a network visualization illustrating the relationships between keywords or concepts related to digital transformation in the public sector, such as "digitalization," "e-government," and "smart city(Pislaru et al., 2024). Different circles (nodes) represent these terms, with the size of the circle indicating the frequency or importance of the term. The edges show the relationships between terms, where thicker lines indicate stronger relationships. Different colors in groups of circles indicate clusters or groups of closely related terms. This visualization helps in identifying key themes and trends in the context of digital transformation, with larger and more prominent terms indicating key concepts that are frequently discussed. This visualization was created using "VOSviewer" software commonly used for bibliometric analysis.



**Figure 13. Network Map Overlay Visualization**  
(Source : Data Processing Using VOSviewer, 2024)

The Overlay Visualization Network Map in the figure shows the relationships between keywords related to digital transformation in the public sector, with colors representing changes in the relevance or occurrence of these concepts over time, as indicated by the color scale at the bottom of the figure. Large circles indicate concepts that are more important or frequently discussed, while lines connecting the circles show the interrelationships between concepts. The colors of the nodes and lines reflect changing trends, where yellow indicates newer concepts and blue for older ones, helping in understanding the evolution of the topic in recent years.



**Figure 14. Density Visualization Network Map**  
(Source : Data Processing Using VOSviewer, 2024)

The Density Visualization Network Map in the figure shows the density of distribution of keywords or concepts related to digital transformation in the public sector. The colors on the map reflect the density or frequency of occurrence of terms in the network, with red and yellow indicating areas of high density or frequently discussed terms, while green and blue indicate areas of lower density. Areas in red or yellow represent the center of attention or main topics of discussion, such as "digitalization," "e-government," and "public organization," which are the focus in the literature or data analyzed. This map helps identify key areas and sub-topics of importance in the context under study.

## Conclusion

This research presents a comprehensive overview of trends and innovations in digital transformation in the public sector, obtained through data analysis from Scopus and visualization using VOSviewer. The findings of this research confirm that digital transformation in the public sector is more than just the adoption of new technologies. The process includes comprehensive changes in organizational structure, business processes, work culture, as well as managerial capabilities to manage technological innovations. Strong leadership, active engagement from all stakeholders, including the public, and the right policy support have proven to be critical success factors for digital transformation. In addition, flexible and innovation-oriented regulatory and policy support is needed to ensure successful technology adoption in various sectors. The success of digital transformation is also determined by organizational readiness in terms of adequate technological infrastructure and human resource competencies, especially digital skills among public sector employees.

From a global perspective, digital transformation in the public sector faces a number of challenges, such as technology infrastructure gaps, resistance to change among employees, and low levels of digital literacy. In Indonesia in particular, these challenges are compounded by the digital divide between urban and rural areas, which impacts the quality of public services in remote areas. Successful digital transformation in Indonesia will require significant efforts to improve access to digital technology, strengthen infrastructure, and ensure ongoing training for civil servants to adopt new technologies such as artificial intelligence (AI) and the Internet of Things (IoT).

In addition, digital transformation in Indonesia can be strengthened through increased collaboration between the public and private sectors, particularly in building more equitable digital infrastructure. The Indonesian government can leverage public-private partnerships to accelerate digitalization in remote areas and improve the quality of public services.

Furthermore, the adoption of clear and measurable performance indicators, such as increased public digital access, decreased bureaucratic time, and number of employees trained in digital skills, will be helpful in monitoring and measuring the success of digital transformation initiatives.

The research also highlights the need for a holistic and collaborative approach to managing digital transformation, involving all stakeholders from government, the private sector and society at large. Digital skills development, investment in technology, and regulatory adjustments are key to the long-term success of this transformation. Overall, this research makes a significant contribution to the literature on digital transformation in the public sector, with a focus on the challenges and opportunities faced by developing countries such as Indonesia. The findings not only provide practical insights for policy makers, but also for academics who want to understand more about the dynamics and development of digital transformation in the public sector. It is hoped that the strategies suggested in this research can guide the Indonesian government and other countries in designing and implementing sustainable and inclusive digital transformation policies.

This research can be further expanded by incorporating primary data, such as interviews or surveys, to get a more in-depth picture of the challenges faced by the public sector in implementing digital technology. Future research should also consider the role of the community, especially in remote areas, in supporting digital transformation. In addition, it is important to dig deeper into the impact of changes in organizational culture in the public sector, especially related to the behavior of civil servants. Case study-based research in several regions or local governments will provide a clearer picture of policies that have been successful or not in implementing digitalization. Given the rapid development of technologies, such as artificial intelligence (AI) and the Internet of Things (IoT), future research should also explore how the application of these technologies can improve the quality and efficiency of public services. By considering these matters, it is hoped that future research can provide deeper insights into the dynamics of digital transformation in the public sector, especially in developing countries such as Indonesia.

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## References

- Abuzyarova, D., Belousova, V., Krayushkina, Z., Lonshcikova, Y., Nikiforova, E., & Chichkanov, N. (2019). The role of human capital in science, technology and innovation. *Foresight and STI Governance*, 13(2), 107–119. <https://doi.org/10.17323/2500-2597.2019.2.107.119>
- Agbozo, E., & Asamoah, B. K. (2019). The role of e-government systems in ensuring government effectiveness and control of corruption. *R-Economy*, 5(2), 53–60. <https://doi.org/10.15826/recon.2019.5.2.006>
- Alves, R., Caneiras, C., Santos, A. I., Barbosa, P., Cardoso, J., Caseiro, P., Vitorino, M. J., Pereira, J., & Escoval, A. (2020). Medical electronic prescription for home respiratory care services (Pem-crd) at a portuguese university tertiary care centre (2014–2018): A case study. *Sustainability (Switzerland)*, 12(23), 1–11. <https://doi.org/10.3390/su12239859>
- Angtyan, H. (2019). ADKAR Model in Change Management. *International Review of Management and Business Research*, 8, 179–182. [https://doi.org/10.30543/8-2\(2019\)-4](https://doi.org/10.30543/8-2(2019)-4)
- Aseeva, A. (2024). Liable and Sustainable by Design: A Toolbox for a Regulatory Compliant and Sustainable Tech. *Sustainability (Switzerland)*, 16(1). <https://doi.org/10.3390/su16010228>
- Bahl, K., Kiran, R., & Sharma, A. (2023). Scaling Up Banking Performance for the Realisation of Specific Sustainable Development Goals: The Interplay of Digitalisation and Training in the Transformation Journey. *Sustainability (Switzerland)*, 15(18). <https://doi.org/10.3390/su151813798>
- Bajraliu, A., & Qorraj, G. (2023). Digital Transformation’S Impact on Sustainable Hr Management: Comparative Study of Work-Life Balance and Skill Development in Public Versus Private Sectors of a Developing Country. *Public Policy and Administration*, 22(3), 358–369. <https://doi.org/10.5755/j01.ppaa.22.3.35071>
- Bonomi Savignon, A., Zecchinelli, R., Costumato, L., & Scalabrini, F. (2024). Automation in public sector jobs and services: a framework to analyze public digital transformation’s impact in a data-constrained environment. *Transforming Government: People, Process and Policy*, 18(1), 49–70. <https://doi.org/10.1108/TG-04-2023-0044>
- Borgogno, O., & Colangelo, G. (2019). Data sharing and interoperability: Fostering innovation and competition through APIs. *Computer Law and Security Review*, 35(5). <https://doi.org/10.1016/j.clsr.2019.03.008>
- Brochado, Â. F., Rocha, E. M., & Costa, D. (2024). A Modular IoT-Based Architecture for Logistics Service Performance Assessment and Real-Time Scheduling towards a Synchromodal Transport System. *Sustainability (Switzerland)*, 16(2). <https://doi.org/10.3390/su16020742>

- Bunduchi, R., Tursunbayeva, A., & Pagliari, C. (2020). Coping with institutional complexity: Intersecting logics and dissonant visions in a nation-wide healthcare IT implementation project. *Information Technology and People*, 33(1), 311–339. <https://doi.org/10.1108/ITP-08-2018-0373>
- Correa-Ospina, M., Saxena, D., & Pinzón, B. H. D. (2021). Mechanisms underpinning the usage of e-government services by businesses: A proposal based on previous empirical research. *EJournal of EDemocracy and Open Government*, 13(2), 154–183. <https://doi.org/10.29379/jedem.v13i2.685>
- Daub, M., Domeyer, A., de Lamaa, A., & Renz, F. (2020). Digital public services: How to achieve fast transformation at scale. *McKinsey Insights*, July, N.PAG-N.PAG. <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/digital-public-services-how-to-achieve-fast-transformation-at-scale>
- Debeljak, A., & Dečman, M. (2022). Digital Transformation of Slovenian Urban Municipalities: A Quantitative Report on the Impact of Municipality Population Size on Digital Maturity. *NISPAcee Journal of Public Administration and Policy*, 15(2), 25–51. <https://doi.org/10.2478/nispa-2022-0012>
- Dečman, M., Stare, J., & Klun, M. (2022). The impact of the COVID-19 crisis on the development of the information society in Slovenia. *Administratie Si Management Public*, 2022(39), 77–96. <https://doi.org/10.24818/amp/2022.39-05>
- del Olmo-García, F., Crecente-Romero, F. J., del Val-Núñez, M. T., & Sarabia-Alegría, M. (2023). Entrepreneurial activity in an environment of digital transformation: an analysis of relevant factors in the euro area. *Humanities and Social Sciences Communications*, 10(1). <https://doi.org/10.1057/s41599-023-02270-0>
- Deloitte Insights. (2021). *Seven pivots for government's digital transformation*.
- Devlin, C., & Coaffee, J. (2023). Planning and technological innovation: the governance challenges faced by English local authorities in adopting planning technologies. *International Journal of Urban Sciences*, 27(S1), 149–163. <https://doi.org/10.1080/12265934.2021.1997632>
- Dong, H., Hussain, F., & Chang, E. (2007). *An Integrative view of the concept of Digital Ecosystem*. <https://doi.org/10.1109/ICNS.2007.33>
- Eveland, J., & Tornatzky, L. G. (1990). *Technological Innovation as a Process* (pp. 27–50).
- Farhan HR, M., & Nurmandi, A. (2022). *Government Data Processing Mechanism to Support Smart City: A Bibliometric Review BT - HCI International 2022 – Late Breaking Posters* (C. Stephanidis, M. Antona, S. Ntoa, & G. Salvendy (eds.); pp. 498–506). Springer Nature Switzerland.

- Galushi, L. T., & Malatji, T. L. (2022). Digital Public Administration and Inclusive Governance at the South African Local Government, in Depth Analysis of E-Government and Service Delivery in Musina Local Municipality. *Academic Journal of Interdisciplinary Studies*, 11(6), 116–126. <https://doi.org/10.36941/ajis-2022-0154>
- Gangneux, J., & Joss, S. (2022). Crisis as driver of digital transformation? Scottish local governments' response to COVID-19. *Data and Policy*, 4(1). <https://doi.org/10.1017/dap.2022.18>
- Ghaleb, E. A. A., Dominic, P. D. D., Singh, N. S. S., & Naji, G. M. A. (2023). Assessing the Big Data Adoption Readiness Role in Healthcare between Technology Impact Factors and Intention to Adopt Big Data. *Sustainability (Switzerland)*, 15(15). <https://doi.org/10.3390/su151511521>
- Girard, T. (2024). National Identity and the Limits of Platform Power in the Global Economy. *International Studies Quarterly*, 68(3). <https://doi.org/10.1093/isq/sqae090>
- Gudmundsdottir, S., Sigurjonsson, T. O., Hlynisdottir, E. M., Fridriksdottir, S. D., & Ingibjargardottir, I. S. (2024). Sustainable Digital Change: The Case of a Municipality. *Sustainability (Switzerland)*, 16(3). <https://doi.org/10.3390/su16031319>
- Guo, J., & Shen, X. (2024). Does Digitalization Facilitate Environmental Governance Performance? An Empirical Analysis Based on the PLS-SEM Model in China. *Sustainability (Switzerland)*, 16(7). <https://doi.org/10.3390/su16073026>
- Heidhues, P., Köster, M., & Kőszegi, B. (2024). A Theory of Digital Ecosystems. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4991830>
- Hien, B. N., Tuyen, N. T. K., Lan, N. T., Ngan, N. T. K., & Thanh, N. N. (2024). the Impact of Digital Government Initiatives on Public Value Creation: Evidence From Ho Chi Minh City - Vietnam. *Revista de Gestao Social e Ambiental*, 18(2), 1–23. <https://doi.org/10.24857/RGSA.V18N2-092>
- Hietala, H., Päivärinta, T., Annanperä, E., Taskinen, P., & Liukkunen, K. (2023). Toward Collective Ambidexterity in Public Sector Digital Initiatives: A Case of the Finnish Water Sector. *Digital Government: Research and Practice*, 4(4). <https://doi.org/10.1145/3609802>
- Huaytan, J. V. P., Rojas, G. G. R., Ruiz-Balvin, M. C., Roldan, F. A. G., Leiva, N. A. D., Gordillo-Flores, R. E., Melly, J. L. I., & Tapia-Silguera, R. D. (2024). Digital Transformation in Public Hospital Management: Improving the Patient Experience. *Revista de Gestao Social e Ambiental*, 18(4). <https://doi.org/10.24857/rgsa.v18n4-046>
- Huo, C., Ma, S., & Liu, X. (2022). Hotness prediction of scientific topics based on a bibliographic knowledge graph. *Information Processing and Management*, 59(4), 102980. <https://doi.org/10.1016/j.ipm.2022.102980>

- Ibáñez-Jiménez, J. W., & Palomo-Zurdo, R. (2024). Wine tokenisation: the opportunity of DLT technology for the economic and social challenges of the wine sector. *REVESCO Revista de Estudios Cooperativos*, 146. <https://doi.org/10.5209/REVE.95352>
- Irani, Z., Abril, R. M., Weerakkody, V., Omar, A., & Sivarajah, U. (2023). The impact of legacy systems on digital transformation in European public administration: Lesson learned from a multi case analysis. *Government Information Quarterly*, 40(1). <https://doi.org/10.1016/j.giq.2022.101784>
- Isaeva, N., Gruenewald, K., & Saunders, M. (2020). Trust theory and customer services research: theoretical review and synthesis. *The Service Industries Journal*, 40, 1–33. <https://doi.org/10.1080/02642069.2020.1779225>
- Iyer, D. K., & Kuriakose, F. (2024). Digital Platforms as (Dis)Enablers of Urban Co-Production: Evidence From Bengaluru, India. *Urban Planning*, 9. <https://doi.org/10.17645/up.7262>
- Kemal, A. A., & Shah, M. H. (2023). Digital innovation in social cash organizations – the effects of the institutional interactions for transforming organizational practices. *Information Technology and People*, 37(5), 2092–2126. <https://doi.org/10.1108/ITP-02-2023-0176>
- Kristiyanto, E. N. (2016). Urgensi Keterbukaan Informasi dalam Penyelenggaraan Pelayanan Publik (Urgency of Disclosure of Information in The Implementation of Public Service). *Jurnal Penelitian Hukum De Jure*, 16(2), 231. <https://doi.org/10.30641/dejure.2016.v16.231-244>
- László, G., Deutsch, N., & Berényi, L. (2024). Teachers' Perception of Some Effects of the COVID-19 Lockdown: The Case Study of Ludovika University of Public Service. *Social Sciences*, 13(2). <https://doi.org/10.3390/socsci13020111>
- Latupeirissa, J. J. P., Dewi, N. L. Y., Prayana, I. K. R., Srikandi, M. B., Ramadiansyah, S. A., & Pramana, I. B. G. A. Y. (2024). Transforming Public Service Delivery: A Comprehensive Review of Digitization Initiatives. *Sustainability (Switzerland)*, 16(7). <https://doi.org/10.3390/su16072818>
- Lawelai, H. (2023). Understanding Digital Governance in Smart Cities: In-Depth Study Utilizing VOSviewer and CiteSpace. *E3S Web of Conferences*, 440, 1–11. <https://doi.org/10.1051/e3sconf/202344007003>
- Lawelai, H., & Nurmandi, A. (2024). Analyzing Smart Cities Governance Publications Using CiteSpace: Integration of Organizational Strategy and Human Resources for Sustainable Urban Development. In *Communications in Computer and Information Science: Vol. 1957 CCIS*. Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-49212-9\\_6](https://doi.org/10.1007/978-3-031-49212-9_6)
- Li, Y., Fan, Y., & Nie, L. (2023). Making governance agile: Exploring the role of artificial intelligence in China's local governance. *Public Policy and Administration*. <https://doi.org/10.1177/09520767231188229>

- Mariani, I., & Bianchi, I. (2023). Conceptualising Digital Transformation in Cities: A Multi-Dimensional Framework for the Analysis of Public Sector Innovation. *Sustainability (Switzerland)*, 15(11). <https://doi.org/10.3390/su15118741>
- Maulana, R. Y., Durnik, M., & Decman, M. (2024). Collaborative Approach on Digital Government Transformation: In-Depth Analysis from Expert Interview. *NISPAcee Journal of Public Administration and Policy*, 17(1), 94–119. <https://doi.org/10.2478/nispa-2024-0005>
- Mergel, I., Dickinson, H., Stenvall, J., & Gasco, M. (2023). Implementing AI in the public sector. *Public Management Review*. <https://doi.org/10.1080/14719037.2023.2231950>
- Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly*, 36(4). <https://doi.org/10.1016/j.giq.2019.06.002>
- Mlambo, C. (2022). Politics and the natural resource curse: Evidence from selected African states. *Cogent Social Sciences*, 8(1). <https://doi.org/10.1080/23311886.2022.2035911>
- Moore, S. (2019). Digital government, public participation and service transformation: The impact of virtual courts. *Policy and Politics*, 47(3), 495–509. <https://doi.org/10.1332/030557319X15586039367509>
- Mutiarin, D., Misran, Rukmana, N. S., & Ningtyas, T. (2024). Bridging the digital divide through digital infrastructure. *Journal of Infrastructure, Policy and Development*, 8(8), 1–15. <https://doi.org/10.24294/jipd.v8i8.6817>
- Nguyen, T. Q., Ngoc, P. T. A., Phuong, H. A., Duy, D. P. T., Hiep, P. C., McClelland, R., & Noroozi, O. (2024). Digital competence of Vietnamese citizens: An application of digcomp framework and the role of individual factors. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-024-12585-3>
- Onyango, G., & Ondiek, J. O. (2023). Digitalising analogue policy targets! ‘Digital capabilities’ of older persons and policy digitalisation of social safety net programs in a developing country context. *Journal of Technology in Human Services*, 41(4), 348–375. <https://doi.org/10.1080/15228835.2023.2263494>
- Palos-Sánchez, P. R., Baena-Luna, P., García-Ordaz, M., & Martínez-López, F. J. (2023). Digital Transformation and Local Government Response to the COVID-19 Pandemic: An Assessment of Its Impact on the Sustainable Development Goals. *SAGE Open*, 13(2). <https://doi.org/10.1177/21582440231167343>
- Pislaru, M., Vlad, C. S., Ivascu, L., & Mircea, I. I. (2024). Citizen-Centric Governance: Enhancing Citizen Engagement through Artificial Intelligence Tools. *Sustainability (Switzerland)*, 16(7). <https://doi.org/10.3390/su16072686>

- Rogers, E., Singhal, A., & Quinlan, M. (2019). Diffusion of Innovations. In *An Integrated Approach to Communication Theory and Research, Third Edition* (pp. 182–186). <https://doi.org/10.4324/9780203710753-35>
- Saukkonen, P., Elovainio, M., Salovaara, S., Virtanen, L., Kaihlanen, A. M., Kainiemi, E., Vehko, T., & Heponiemi, T. (2024). Perceived effects of digitalization on social work in Finland: A network analysis approach. *International Social Work*. <https://doi.org/10.1177/00208728241265015>
- Schotten, M., El Aisati, M., Meester, W. J. N., Steinginga, S., & Ross, C. A. (2017). A brief history of Scopus: The world's largest abstract and citation database of scientific literature. In *Research Analytics: Boosting University Productivity and Competitiveness through Scientometrics* (pp. 31–58). Auerbach Publications. <https://doi.org/10.1201/9781315155890>
- Seo, H., & Myeong, S. (2020). The priority of factors of building government as a platform with analytic hierarchy process analysis. *Sustainability (Switzerland)*, 12(14). <https://doi.org/10.3390/su12145615>
- Sihombing, T., & Lumbantobing, R. D. H. (2024). Digital technology adoption for village public administration—Evidence from Indonesia. *Journal of Infrastructure, Policy and Development*, 8(4), 1–18. <https://doi.org/10.24294/jipd.v8i4.3444>
- Tangi, L., Janssen, M., Benedetti, M., & Noci, G. (2021). Digital government transformation: A structural equation modelling analysis of driving and impeding factors. *International Journal of Information Management*, 60. <https://doi.org/10.1016/j.ijinfomgt.2021.102356>
- Vinarski-Peretz, H., & Kidron, A. (2024a). Antecedents of public managers' collective implementation efficacy as they actualize new public services. *Public Money and Management*, 44(5), 418–427. <https://doi.org/10.1080/09540962.2023.2203869>
- Vinarski-Peretz, H., & Kidron, A. (2024b). Antecedents of public managers' collective implementation efficacy as they actualize new public services. *Public Money and Management*, 44(5), 418–427. <https://doi.org/10.1080/09540962.2023.2203869>
- Wang, X., Chen, Y., Liu, Y., Yao, L., Estill, J., Bian, Z., Wu, T., Shang, H., Lee, M. S., Wei, D., Tian, J., Ma, B., Wang, Y., Tian, G., & Yang, K. (2019). Reporting items for systematic reviews and meta-analyses of acupuncture: The PRISMA for acupuncture checklist. *BMC Complementary and Alternative Medicine*, 19(1), 1–10. <https://doi.org/10.1186/s12906-019-2624-3>
- Werner, T., & Lehan, A. (2023). Enterprise Architecture Management (EAM) as a fundamental approach for the digital transformation of the German road infrastructure management. *Transportation Research Procedia*, 72, 1098–1104. <https://doi.org/10.1016/j.trpro.2023.11.564>
- Wirtz, B. W., Weyerer, J. C., & Schichtel, F. T. (2019). An integrative public IoT framework for smart government. *Government Information Quarterly*, 36(2), 333–345. <https://doi.org/10.1016/j.giq.2018.07.001>

Zhou, Z., Lin, S., Shi, J., Huang, J., & Han, X. (2024). Can Mega Sporting Events Promote Urban Green Transformation? Evidence from China. *Sustainability (Switzerland)*, 16(14), 1–18. <https://doi.org/10.3390/su16146109>