

Smart cities and government services: a decade of research trends, networks, and emerging directions

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ABSTRACT

Purpose: to analyze research trends, publication patterns, collaboration networks, thematic clusters, and emerging research directions concerning the relationship between smart cities and government service development during the 2015–2025 period.

Method: This study employs a bibliometric analysis combined with the PRISMA framework to systematically identify, screen, and analyze relevant literature on smart cities and government service development published between 2015 and 2025. A total of 67 eligible publications were analyzed to identify publication trends, contributing countries, journals, authors, subject areas, collaboration networks, and thematic clusters.

Findings: smart city and government service research is increasingly multidisciplinary, with Indonesia and China as leading contributors. The main themes focus on communication technology and e-governance, as well as accountability and public administration, indicating a shift toward integrated and citizen-oriented smart government.

Implications: these findings can support policymakers in designing more inclusive, secure, and responsive smart government strategies.

Originality: lies in its decade-long bibliometric mapping of smart city and government service research, integrating technological, governance, and stakeholder perspectives to identify dominant themes, research networks, and emerging directions.



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Introduction

The rapid advancement of information and communication technologies (ICTs), artificial intelligence, cloud computing, the internet of things (IoT), blockchain, and digital platforms has fundamentally transformed the way cities are managed and how governments deliver public services (Alahi et al., 2023; Matei & Cocosatu, 2024). In this context, the concept of the smart city has emerged as an important approach to

addressing increasingly complex urban challenges by integrating technology, data, infrastructure, institutions, and citizens (Almulhim & Yigitcanlar, 2025). Smart city initiatives seek not only to improve the efficiency of urban operations but also to enhance the accessibility, transparency, responsiveness, and quality of government services (Das, 2024). As urbanization continues to accelerate, governments are under increasing pressure to provide public services that are efficient, inclusive, transparent, adaptive, and responsive to citizens' needs (Egba et al., 2026). Consequently, the relationship between smart city development and government services has become an increasingly important area of interdisciplinary research.

The development of smart cities has created significant opportunities to transform government service delivery (Kaiser, 2024). Digital technologies enable governments to integrate information, optimize resources, automate administrative processes, and provide services through digital platforms (Latupeirissa et al., 2024). For example, cloud-based architectures can support the interoperability and accessibility of e-government services (Barakat et al., 2019), while government affairs service platforms can facilitate the integration of public services within smart city environments (Lv et al., 2018). Artificial intelligence has also been identified as a mechanism for enhancing the efficiency and effectiveness of e-government services (Al-Besher & Kumar, 2022). Similarly, recommender systems have been proposed to personalize government services according to citizens' needs in smart city environments (Lin, 2022). These developments demonstrate that smart city technologies are increasingly shifting government services from conventional, fragmented administrative systems toward integrated, intelligent, and citizen-oriented service ecosystems.

However, implementing smart city technologies does not automatically guarantee improvements in government services (Bittencourt et al., 2025). Several technological, institutional, social, and governance-related challenges remain (Phothong et al., 2026). One fundamental problem is interoperability, because smart city services generally involve multiple systems, platforms, organizations, and service providers that must exchange and process data securely and continuously. Biswas et al. (2023) identify interoperability as a major challenge in smart city services and highlight blockchain as a potential mechanism for improving secure collaboration and service continuity among stakeholders. Security and privacy are also critical concerns, particularly because smart city ecosystems involve collecting, exchanging, and processing large amounts of citizen and government data. Sciarretta et al. (2016), for example, identified the lack of secure delegation mechanisms for accessing resources through APIs as an important technical obstacle in smart city mobile applications. More recent research has likewise emphasized the importance of citizen security and privacy in designing flexible smart city platforms (Stamatiou et al., 2023).

Beyond technological issues, smart city development also presents important challenges related to digital inclusion, institutional capacity, citizen participation, and governance readiness (Kolotouchkina et al., 2024). The benefits of digital government services may be distributed unequally when citizens have different levels of access to digital infrastructure, devices, skills, and online services (Djatkiko et al., 2025). This issue is particularly relevant in developing-country contexts, where differences in digital maturity and institutional capacity may influence the success of smart city initiatives. Research on Malaysian local authorities, for instance, demonstrates the relevance of citizen participation in e-government services and smart city programs (Boon et al., 2020). In Indonesia, Pribadi et al. (2023) identified pivotal factors affecting citizens' adoption and use of smart government services, indicating that technological availability

alone is insufficient to ensure citizen acceptance. Similarly, Debeljak & Dečman (2022) show that the size of urban municipalities can influence their level of digital maturity, suggesting that institutional and organizational characteristics should be considered when examining digital transformation in local government.

The literature further indicates that the shift toward smart cities increasingly involves moving from technology-centered approaches to governance-centered, citizen-oriented, and sustainable models of urban development. Hameed (2019) argues that transforming cities into smart cities requires a clear vision, goals, and strategies encompassing smart infrastructure, smart environments, and smart living. From an e-government perspective, Lytras & Șerban (2020) emphasize that e-government is an important application and driver of smart city development and that regulatory frameworks play a significant role in shaping smart city research and implementation. Nielsen & Millard (2020) further highlight the importance of local context when assessing e-government development, emphasizing that global benchmarks need to account for differences in governmental and societal environments. These findings suggest that smart city development cannot be understood solely from a technological perspective; rather, it must be examined as a multidimensional transformation involving technology, institutions, policies, citizens, and public service delivery.

Recent studies also demonstrate the growing importance of citizen-centered digital services and emerging technologies in improving government responsiveness. Jumroh et al. (2024), for example, found that social media technology can facilitate public service delivery and support more user-centric, transparent, and environmentally aware services in the context of Indonesian local government. Li et al. (2025) further demonstrate the importance of usability in government portal websites in pilot smart cities, showing that the effectiveness of digital government services is closely related to how citizens interact with and experience digital platforms. In addition, Ulrich et al. (2020) highlight the relationship between IoT and the co-production of e-services, reinforcing the importance of citizen involvement in creating and delivering digital public services. At the territorial level, Wang et al. (2022) propose an intelligent and integrated model for territorial development regulation that uses digitalization and analytical capabilities to create more efficient and transparent governance systems. Collectively, these studies indicate that the smart city-government service relationship has expanded from infrastructure and technological implementation toward interoperability, citizen participation, usability, transparency, security, and intelligent governance.

Despite these developments, the existing literature remains fragmented across technological, governance, organizational, and citizen-oriented perspectives. Much of the previous research examines specific technologies, individual applications, particular cities, or isolated dimensions of smart city development. For example, some studies focus on blockchain and interoperability (Biswas et al., 2023), delegated authorization and API security (Sciarretta et al., 2016), cloud architecture (Barakat et al., 2019), artificial intelligence (Al-Besher & Kumar, 2022), or government service platforms (Lv et al., 2018). Other studies emphasize citizen participation, digital maturity, social media, usability, or e-service co-production (Boon et al., 2020; Debeljak & Dečman, 2022; Jumroh et al., 2024; Li et al., 2025; Ulrich et al., 2020). Although these studies provide valuable insights, they do not yet provide a comprehensive picture of how the research landscape concerning smart cities and government services has evolved, which research communities have shaped the field, how major themes have interconnected, and which emerging research directions are likely to influence the next stage of development.

This situation creates an important research gap. First, previous studies tend to emphasize individual technologies or specific implementation contexts rather than mapping the broader intellectual and thematic development of smart city and government service research. Second, systematic evidence on the evolution of publication and citation patterns, influential journals and authors, disciplinary distribution, collaboration networks, and thematic clusters over an extended period remains limited. Third, the emergence of new concepts, including artificial intelligence, blockchain, cloud computing, IoT, citizen co-production, digital inclusion, privacy, and intelligent government platforms, suggests that the field's intellectual structure is continuously changing. Therefore, a longitudinal analysis is needed to identify not only what has been studied but also how the research agenda has shifted and where the field is moving next.

To address this gap, the present study focuses on the period 2015–2025 and provides a systematic bibliometric examination of research on smart cities and government services. The novelty of this study lies in its effort to integrate publication trends, citation development, influential journals and authors, subject areas, research networks, thematic clusters, and emerging topics within a single analytical framework. Rather than concentrating on one technology, one country, or one smart city application, this study seeks to reveal the broader structure and evolution of the research field. The longitudinal perspective is particularly important because 2015–2025 represents a decade of substantial transformation in digital government and smart city research, from an initial emphasis on ICT infrastructure and e-government to more integrated concerns involving intelligent technologies, interoperability, citizen participation, security, privacy, usability, and data-driven governance.

This study is grounded primarily in the smart city and smart government perspectives, which conceptualize urban digital transformation as an interaction among technological infrastructure, institutional capacity, governance mechanisms, public services, and citizen participation. From this perspective, technology is not an end in itself but an enabling mechanism through which governments can improve public value and service outcomes. The literature on e-government further supports this perspective by emphasizing digital transformation as a means of improving government accessibility, efficiency, transparency, and responsiveness (Lytras & Serban, 2020; Nielsen & Millard, 2020). This study therefore extends the smart city perspective from a technology-oriented understanding to a broader governance and public-service perspective, in which interoperability, digital maturity, citizen participation, privacy, usability, and institutional readiness are important dimensions of smart city development.

Accordingly, this study aims to analyze the evolution, structure, and future direction of research on smart cities and government services from 2015 to 2025. Specifically, it seeks to: (1) examine annual publication and citation trends to identify the growth and development of the field; (2) identify the most influential journals and authors contributing to smart city and government service research; (3) analyze the disciplinary distribution of the literature; (4) map research networks and thematic clusters to identify dominant research themes and relationships among them; and (5) identify emerging and potential research topics that may shape the future development of smart city and government service research. Through these objectives, the study moves beyond a conventional literature review by providing a quantitative, structured representation of the field's intellectual development.

This research is important both academically and practically. Academically, understanding the evolution of smart city and government service research is necessary because the field is highly interdisciplinary and rapidly changing. A systematic mapping of its intellectual structure can clarify dominant research streams, identify underexplored areas, and reveal connections between technological and governance-oriented research. Practically, the findings can help policymakers and local governments understand which issues have received substantial scholarly attention and which emerging challenges require further consideration. In particular, identifying research trends related to interoperability, privacy and security, citizen participation, digital inclusion, artificial intelligence, usability, and institutional readiness can support the development of more inclusive, resilient, and citizen-centered smart city strategies.

Method

This study used a bibliometric analysis combined with a systematic literature review to examine the development of scholarly research on smart cities and government services from 2015–2025. A bibliometric approach was selected because it enables the systematic quantitative analysis of scientific publications and provides an objective overview of research productivity, citation patterns, influential publications, authors, journals, research networks, and thematic developments within a particular field. The study adopted the preferred reporting items for systematic reviews and meta-analyses (PRISMA) framework to support a transparent, systematic, and reproducible process of literature identification, screening, eligibility assessment, and inclusion. The research focused specifically on scientific literature addressing the relationship between smart city development and government services, including topics related to e-government, smart government, digital public services, citizen participation, interoperability, artificial intelligence, cloud computing, blockchain, IoT, data governance, privacy, security, and digital transformation. The publication period was limited to 2015–2025 to capture a decade of research development and to identify both established and emerging research themes in the field.

The literature identification process involved searching the selected academic database using keywords and combinations of terms related to the research focus. The search strategy was designed to capture publications discussing smart cities in relation to government and public service development. The initial search generated 57,375 records published from 2015 to 2025. These records represented the initial pool of potentially relevant scientific publications and subsequently underwent a structured screening and selection process. Figure 1 presents the overall literature identification and selection procedure, illustrating the PRISMA-based process from initial identification through screening, eligibility assessment, and final inclusion.

As illustrated in Figure 1, the PRISMA procedure was implemented through four main stages: identification, screening, eligibility, and inclusion. This procedure progressively reduced the initial number of records while maintaining consistency with the predefined research scope and selection criteria. Following the identification stage, the records were subjected to an initial screening process to remove publications that did not correspond sufficiently to the research topic or did not meet the predetermined selection criteria. From the initial 57,375 records, 440 articles were retained for further evaluation after the screening process. At this stage, the focus was on the publication's relevance to smart city development and government services, as well as its suitability for subsequent bibliometric analysis.

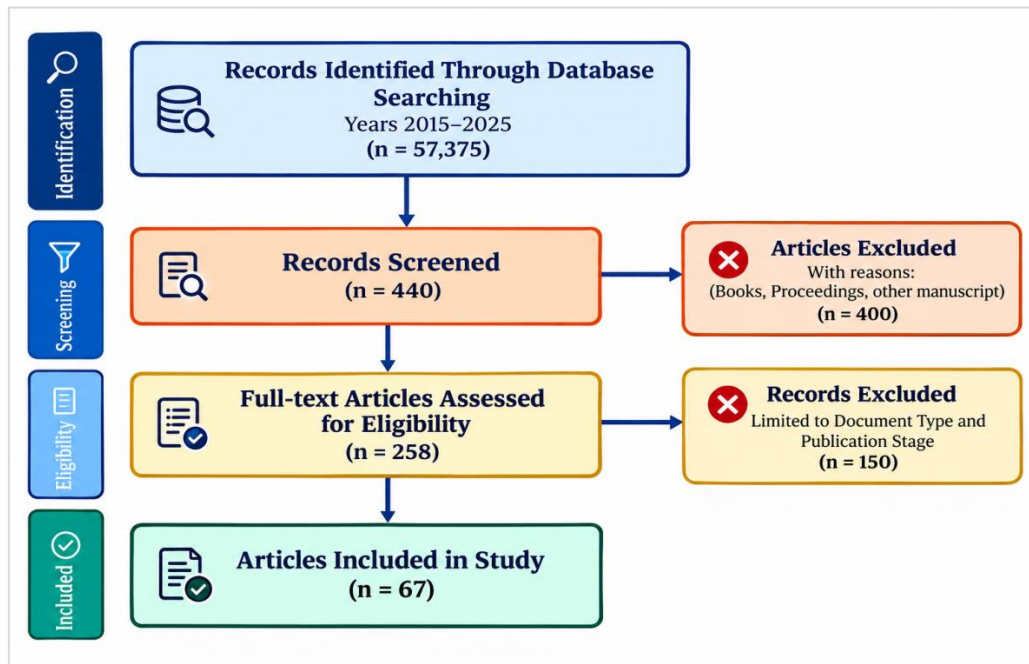


Figure 1 PRISMA method

The eligibility assessment was then conducted on the 440 retained articles. Each publication was examined more closely to determine whether its content, publication characteristics, and thematic focus aligned with the study's objectives. Following this assessment, 258 articles were considered eligible for further consideration. This stage was important to ensure that the final dataset represented research substantively related to the relationship between smart cities and government services, rather than merely containing general references to urban technology. The final inclusion stage involved applying the remaining selection criteria to the eligible publications. Of the 258 articles assessed, 200 records were excluded because they did not correspond to the required document characteristics, including publications in the form of books, conference proceedings, or other types of manuscripts outside the scope of the study. A further 15 articles were excluded because they did not satisfy the specified document-type or publication-stage requirements.

After completing all stages of the PRISMA selection process, 67 articles met the established inclusion criteria and formed the final dataset for the bibliometric analysis. The resulting dataset was considered sufficiently focused to represent the relevant scholarly literature on smart cities and government services during 2015–2025. The final set of 67 publications was subsequently analyzed using bibliometric techniques to identify the development and intellectual structure of the research field. The analysis examined several dimensions, including annual publication and citation trends, influential journals, productive and influential authors, subject areas, research networks, keyword co-occurrence, thematic clusters, and emerging research topics. These analyses aimed to identify dominant research themes, relationships among research topics, and potential directions for future research. Combining the PRISMA framework and bibliometric analysis enabled this study to provide both a systematic selection of relevant literature and a quantitative mapping of the research landscape. Consequently, the methodological approach provides a structured basis for understanding how research on smart cities and government services has evolved over the 2015–2025 period and for identifying emerging research priorities within the field.

Results and discussion

Number of publications per year

The annual distribution of publications provides an overview of the development and dynamics of global scholarly interest in the relationship between smart cities and government service development from 2015 to 2025. Analyzing publication trends over time helps identify periods of increasing or declining research attention and understand how developments in technology, public governance, and global circumstances may have influenced the research agenda. Figure 2 presents the annual publication trend.

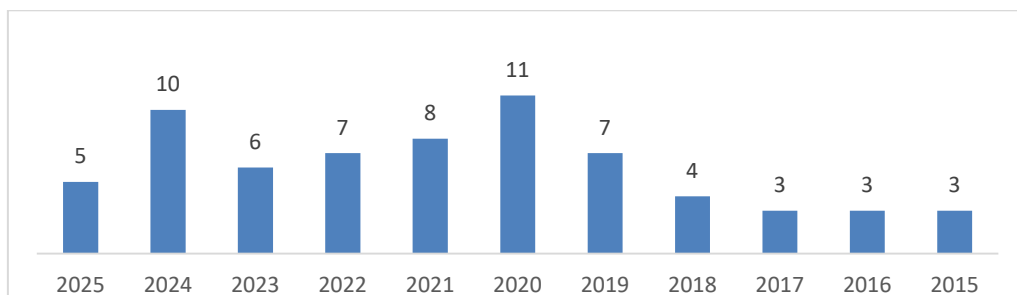


Figure 2 number of publications per year

Source: secondary data, processed

As shown in Figure 2, the number of publications fluctuated considerably throughout 2015–2025, with the highest research productivity in 2020 and 2021. In 2020, the highest number was recorded, with 11 publications, followed by 8 in 2021. This increase indicates that smart city and government service research received substantially greater scholarly attention during this period. One possible explanation is the emergence of the COVID-19 pandemic, which accelerated the need for digital transformation, remote public services, digital communication, and technology-enabled governance. Restrictions on physical interaction and disruptions to conventional public service delivery encouraged governments and researchers to explore digital solutions to maintain public services and manage urban challenges. Therefore, the increase in publications during 2020–2021 may reflect the growing relevance of smart city technologies and digital government in responding to rapidly changing societal and administrative conditions.

Following the peak in 2020 and 2021, the publication trend fluctuated. In 2022, the number of publications declined to 7 articles, indicating a temporary reduction in research output compared with the preceding peak. However, research activity subsequently increased, reaching 10 publications in 2024. This recovery demonstrates that scholarly interest in smart cities and government services remained strong despite the fluctuations observed during the post-pandemic period. The renewed increase may indicate a broader transition in the research agenda from immediate digital responses to longer-term issues associated with digital transformation, intelligent governance, integrated public services, and the sustainability of smart city initiatives.

In contrast, the 2015–2019 period was characterized by relatively limited publication activity, with approximately 3–4 publications per year. The comparatively low number of publications during these early years suggests that research on the intersection of smart city development and government services was still emerging. During this period, scholarly attention was more likely to focus on the technological and

infrastructural foundations of smart cities, including ICT adoption, digital infrastructure, and the initial development of e-government systems. As the smart city concept matured, research gradually expanded toward broader issues involving public service quality, citizen participation, interoperability, data governance, security, and digital transformation.

Overall, the publication trend demonstrates a gradual development of scholarly interest followed by a substantial expansion and subsequent stabilization of research activity. The sharp increase during 2020–2021 highlights the growing importance of digital government and smart city technologies in addressing unprecedented challenges, while the subsequent fluctuations suggest an evolving research agenda rather than a decline in the topic's relevance. The increase observed again in 2024 further indicates that smart city and government service research remains an active and developing field. These findings provide an important basis for examining not only the quantitative growth of publications but also the thematic evolution, influential research networks, and emerging research directions within the field during the 2015–2025 period.

Number of publications by country

The geographical distribution of publications provides an overview of the global research landscape concerning the relationship between smart cities and government service development. Analyzing publications by country helps identify the geographical concentration of scholarly contributions, recognize countries that have emerged as major contributors to the field, and observe how smart city and digital government research has developed across different national contexts. Figure 3 presents the distribution of publications by country.

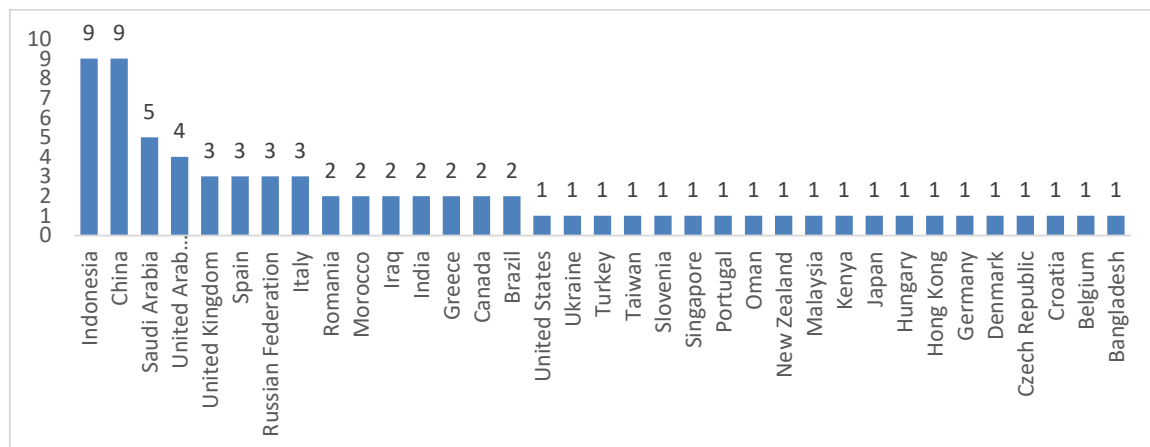


Figure 3 number of publications by country

Source: secondary data, processed

Figure 3 shows the dominance of Indonesia and China in publications on smart city and government service development, with 9 publications each. This indicates that both countries have a very high interest in applying smart technology to manage cities and improve public services. The rapid increase in urbanization in Indonesia and China demands smart solutions to manage infrastructure, transportation, energy, and other aspects of city life. Therefore, research related to smart cities has become a significant focus in both countries. Both Indonesia and China are striving to utilize information and communication technology (ICT) to improve the efficiency of government administration and provide better services to the public. This makes the topic highly

relevant and urgent, given the significant challenges major cities face in efficient and sustainable management. Besides Indonesia and China, other countries also made significant contributions to smart city research, including Saudi Arabia, the United Kingdom, the Russian Federation, and Spain, each with 3 publications.

These countries are likely to have a strong focus on implementing smart city and digital solutions to improve government services and the quality of life for their citizens. Saudi Arabia, for example, is investing heavily in technology to develop smart cities as part of their vision to modernize infrastructure and the economy. On the other hand, European countries like the UK and Spain have long been pioneers in adopting smart technologies, focusing on improving public service efficiency, reducing pollution, and sustainable energy management. With diverse backgrounds, these countries play a significant role in creating smart city models that can serve as global benchmarks.

Most other countries have only 1 to 2 publications on this topic, such as the United States, Ukraine, Turkey, Japan, and several other European countries. This suggests that although smart cities are becoming increasingly popular worldwide, attention to this research may still be limited, especially in countries in the early stages of adopting technology for smart governance. In countries like Malaysia, Kenya, and Portugal, although the number of publications is relatively small, there are indications of interest in this topic. Despite this, many developing countries are only beginning to explore the potential for smart city implementation, and research in these countries tends to be limited in scale or scope. Overall, this graph shows that although a few major countries dominate publications, research on smart cities is beginning to spread globally, with growing interest in various parts of the world, in both developed and developing countries.

The journal that best fits the research topic

Identifying the publication outlets that most frequently disseminate research on smart cities and government service development provides an overview of the major scholarly venues contributing to this research field. This analysis helps identify the publication channels through which knowledge on smart city technologies, digital government, public administration, urban development, and citizen-oriented services is disseminated. Table 1 presents the publication outlets represented in the dataset, together with the number of relevant publications and their respective journal rankings.

Based on Table 1, the two journals that most frequently publish articles related to smart city and government service development are IFIP Advances in Information and Communication Technology and Advances in 21st Century Human Settlements, each with 3 articles. Both journals have a Q3 ranking, indicating that although they do not have the highest reputation compared to Q1 or Q2 journals, they are still relevant sources for smart city research. IFIP Advances in Information and Communication Technology focuses on information and communication technology, which is crucial for implementing smart city solutions such as city management systems and technology integration to improve public services. Meanwhile, Advances in 21st Century Human Settlements addresses urban development and sustainable settlements, aligning with core smart city principles such as smarter energy, transportation, and infrastructure management.

Besides the two main journals, several journals include two articles related to this theme, including Lecture Notes in Computer Science (including the Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), IEEE Access, and CEUR Workshop Proceedings. Lecture Notes in Computer Science is a well-

known journal in computer science and artificial intelligence (AI) and is highly relevant to the application of technology in smart governance, such as using AI to improve the efficiency of public services. IEEE Access, ranked Q2, also makes significant contributions to technology research, focusing on applying technological innovation in the public sector and smart governance. This journal, with a higher ranking, demonstrates high research quality and greater influence among academics.

Table 1 journals relevant to the research theme

Journal name	Amount	Journal rank
IFIP Advances in Information and Communication Technology	3	Q3
Advances in 21st Century Human Settlements	3	Q3
ACM International Conference Proceeding Series	3	Q3
Lecture Notes in Computer Science Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics	2	Q2
IEEE Access	2	Q2
Ceur Workshop Proceedings	2	Q2
Advances in Intelligent Systems and Computing	2	Q3
Voluntas	1	Q2
Transforming Government People Process and Policy	1	Q2
Sensors and Materials	1	Q3
Proceedings of the European Conference on Knowledge Management	1	Q4
Eckm		
Politics and Governance	1	Q1
Planning Malaysia	1	Q2
Nispacee Journal of Public Administration and Policy	1	Q2
Media and Communication	1	Q2

Source: secondary data, processed

Besides journals with larger contributions, several journals contain only one article on this topic but still make an important contribution to research development. For example, Politics and Governance (Q1), which has a significant influence on the study of public policy and government administration, and Nispacee Journal of Public Administration and Policy (Q2), which focuses more on public administration policy. Although the number of articles is limited, these journals add an important dimension to the study of policies and regulations in the implementation of smart cities, as well as the social impact of technologies applied in government.

Most contributing author

Identifying authors who have made substantial contributions to research on smart cities and government service development is important for understanding the field's intellectual development. Author-level analysis can identify researchers whose work has attracted considerable scholarly attention and whose publications have helped shape discussions on digital government, intelligent public services, cloud computing, regulation, security, and privacy. Table 2 presents the five publications with the highest citation counts within the selected dataset, together with their authors, publication sources, citation counts, and journal rankings.

Based on the data presented in Table 2, the authors with the most significant contributions in the field of smart cities are Lv et al. (2018), who published an article titled "Government affairs service platform for smart city" in the journal Future Generation Computer Systems. This article has 157 citations, making it the most impactful article on the list. Publication in a Q1-ranked journal also indicates high research quality and broad influence in information technology and smart governance.

This article discusses the concept of a government service platform for smart cities, an important topic for improving the efficiency and transparency of public services through technology. The article's success in attracting numerous citations reflects the topic's relevance and the practical application of the technology discussed in the research.

Table 2 author contributions

Nu.	Document Title	Authors/Year	Source	Cited by	Journal Rank
1	Government affairs service platform for smart city	Lv et al. (2018)	Future Generation Computer Systems	157	Q1
2	Use of artificial intelligence to enhance e-government services	Al-Besher & Kumar (2022)	Measurement: Sensors	41	Q2
3	Cloud computing in singapore: Key drivers and recommendations for a smart nation	Ng (2018)	Politics and Governance	31	Q1
4	E-Government Insights to Smart Cities Research: European Union (EU) Study and the Role of Regulations	Lytras & Serban (2020)	IEEE Access,	28	Q1
5	A Generic, Flexible Smart City Platform focused on Citizen Security and Privacy	Stamatiou et al. (2023)	ACM International Conference Proceeding Series	24	Q4

Source: secondary data, processed

Among the most prolific authors are Al-Besher & Kumar (2022), with their article titled "Use of artificial intelligence to enhance e-government services," published in the journal *Measurement: Sensors*. Although this article has 41 citations, this number indicates that the research has received significant attention from the academic community. The main focus of this research is the application of artificial intelligence (AI) in government services, which is becoming increasingly relevant in today's digital age. Additionally, Ng's (2018) article "Cloud computing in Singapore: Key drivers and recommendations for a smart nation", published in *Politics and Governance*, received 31 citations. This article discusses the importance of cloud computing in the development of smart cities, specifically in Singapore, which is known as one of the countries with the most advanced digital infrastructure in the world.

Meanwhile, Lytras & Serban (2020). wrote the article "E-Government Insights to smart cities Research: European Union (EU) Study and the Role of Regulations", published in *IEEE Access*. This article has been cited 28 times and provides insights into the role of regulations in Smart City development, particularly in Europe. This article focuses on implementing policies that support technology adoption for more efficient and effective public services. Finally, Stamatiou et al. (2023) presented "A Generic, Flexible Smart City Platform focused on Citizen Security and Privacy", which was published in the *ACM International Conference Proceedings Series*. Although it has only 24 citations, this article offers a fresh perspective on security and privacy in developing a flexible, customizable smart city platform. Overall, although some journals contain only a few articles related to smart cities, *IFIP Advances in Information and Communication Technology* and *Advances in 21st Century Human Settlements* are the main venues for research on this topic, with many articles published. Meanwhile, Q2 and Q1-ranked journals such as *IEEE Access* and *Politics and Governance* also make significant contributions to research on applying technology in smart governance and public policy.

Subject areas related to the theme

The distribution of publications across subject areas provides important evidence of the multidisciplinary character of research on smart cities and government service development. Examining subject areas helps identify the scientific disciplines that contribute most to knowledge development in this field and understand how smart city research extends beyond technological issues into engineering, governance, decision-making, management, and other areas. Table 3 presents the distribution of publications according to the subject areas indexed in Scopus.

Table 3 subject areas related to the theme

Nu.	Subject area	Amount
1	Computer science	39
2	Engineering	24
3	Social sciences	23
4	Decision sciences	16
5	Mathematics	10
6	Business, management and accounting	9
7	Materials science	5
8	Physics and astronomy	4
9	Energy	4
10	Medicine	3
11	Environmental science	2
12	Earth and planetary sciences	2
13	Health professions	1

Source: secondary data, processed

Based on Table 3, several subject areas contribute significantly to research on smart cities and the development of government services. Computer Science dominates, with the most publications: 39 articles. This is logical, given that smart cities rely heavily on information and communication technology (ICT) for city management and public service improvement. This field supports the development of smart information systems, data-driven applications, and the use of artificial intelligence (AI) to optimize public services such as transportation, energy, and urban resource management. With so much research focused on the software and systems used in smart city management, it is no surprise that Computer Science is the most dominant subject area.

In second place, Engineering has 24 publications, reflecting the important role of engineering in developing the physical infrastructure that supports the smart city concept. Engineering contributes significantly to designing intelligent systems for energy management, transportation, buildings, and other infrastructure that are part of the smart city. Engineering is crucial to creating a smart city that is not only based on digital technology but also has efficient and sustainable physical infrastructure. Additionally, Social Sciences (23 publications) show that social aspects are equally important in implementing a smart city. This field focuses on the social impact and public policies related to the use of technology in people's daily lives. Research in Social Sciences helps understand how technology influences social interactions, government policies, and social inclusion within the context of smart cities.

Besides Computer Science, Engineering, and Social Sciences, other subject areas also contribute significantly to this topic. Decision Sciences, with 16 publications, highlights the importance of data-driven decision-making in designing and managing smart cities, including urban planning, resource management, and public policy-making. Mathematics (10 publications) also plays an important role in developing mathematical

models to analyze and optimize various aspects of smart cities, such as energy allocation, transportation, and urban planning. Meanwhile, Business, Management, and Accounting (9 publications) provide insights into business models and financial sustainability in smart city development, particularly budget management and cost efficiency. Overall, the diversity of subject areas involved in this research indicates that smart cities are a multidisciplinary concept that draws on various fields of science to create effective solutions for city management and government services.

Network, development trends, and research density

The keyword network analysis provides an overview of the conceptual structure, research relationships, and thematic development of the literature concerning smart cities and government service development. By examining keyword frequency and co-occurrence, it is possible to identify the concepts that occupy central positions in the research network, the relationships among major themes, and areas that have received greater research attention. Figure 4 visualizes the keyword network and illustrates the relationships among the main concepts identified in the literature.

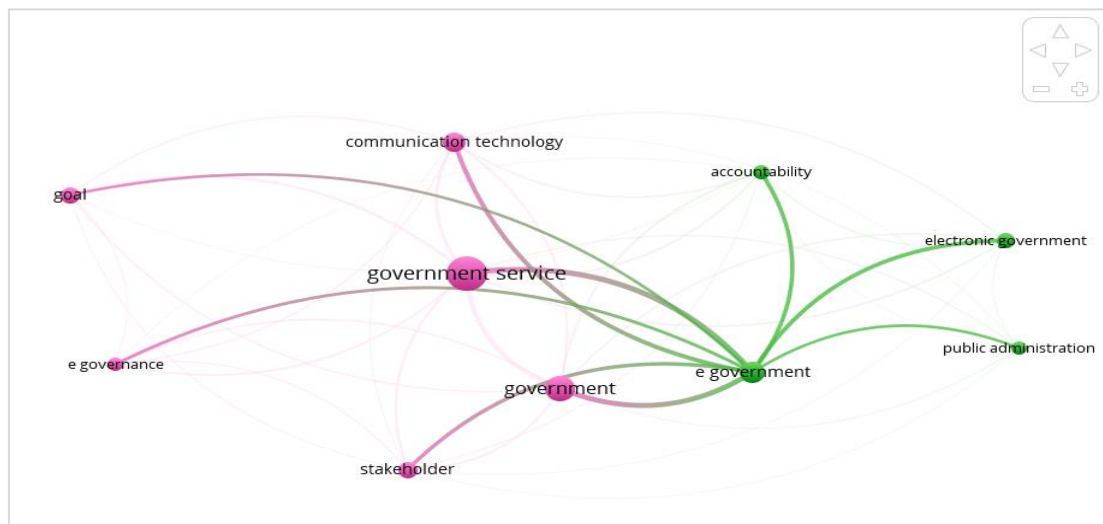


Figure 4 research development network and trends

Source: secondary data, processed

Based on Figure 4, the keyword network visualization shows that "government service" is the keyword most connected to many important concepts in research on smart cities and e-government. This term is strongly connected to various elements, including "e-government," "accountability," "communication technology," and "stakeholder." This network shows that much research focuses on applying technology to improve government services. Specifically, "e-government" and "electronic government" are closely linked to the concept of "public administration," indicating that this study focuses not only on the technical aspects but also on their impact on government management and public administration. On the other hand, "communication technology" is a major driver of more efficient and effective public services.

From this keyword network, the main development trends in smart city and e-government research are clear. The most prominent trend is integrating technology to improve government services and increase public accountability. Keywords like "e-government" and "e-governance" indicate that much research focuses on using

information and communication technology (ICT) to manage and facilitate governmental processes. Another focus is on "accountability," which highlights the importance of transparency and openness in government, achievable through the effective application of technology. This research also underscores the importance of stakeholder roles in ensuring the successful implementation of e-government systems, which are closely related to various aspects of governance and public services.

In terms of research density, several keywords are strongly related, particularly "e-government" and "public administration," indicating a high concentration of studies on implementing e-government in public administration. The density of these connections indicates that this area is a focal point in smart city research, where researchers are extensively exploring how digital systems can improve the efficiency and effectiveness of government services. Other high-density keywords include "government service" and "accountability," pointing to research aimed at improving the quality of government services and ensuring that technology strengthens public transparency and accountability.

This analysis suggests that research on smart cities and e-government increasingly focuses on applying communication technology to improve government services, with an emphasis on accountability and transparency in public administration. This trend highlights that technology serves not only as a tool for efficiency but also as a means of creating more open and responsive governance. This keyword network also indicates the importance of various stakeholders' roles in implementing technology in government, making collaboration key to success in developing an inclusive and effective smart city.

Results of the cluster analysis of the research

Cluster analysis was conducted to identify the principal thematic structures underlying research on the relationship between smart cities and government service development. By grouping keywords that frequently co-occur, cluster analysis provides an overview of the major research orientations and conceptual relationships that characterize the literature. The analysis identified two primary research clusters, reflecting complementary dimensions of smart city and e-government development: the technological and stakeholder-oriented dimension of government service delivery, and the governance-oriented dimension of accountability and public administration. Table 4 presents the results.

Table 4 research clusters

Cluster	Research issues
Cluster 1	Communication technology, e-governance, government, government service, stakeholder
Cluster 2	Accountability, e-government, electronic government, public administration

Source: secondary data, processed

Table 4 shows the results of the research's cluster analysis, which groups the main topics based on keywords found in studies on smart cities and government services. These results provide important insights into current research focuses in e-government development and how technology impacts public services. The two main clusters found are communication technology in government services and accountability in e-government. The first cluster focuses on the role of communication technology in supporting e-government and more efficient government services. Keywords such as "communication technology," "e-governance," "government," "government service," and

"stakeholder" indicate that much research is exploring how information and communication technology (ICT) can improve public services and the relationship between government and society. The main focus of research in this cluster is using digital systems to deliver information and public services faster, more transparently, and more inclusively. As technology adoption grows across sectors, this research plays a crucial role in addressing how to leverage communication technology to improve government services and strengthen interactions between the government and stakeholders such as the public, the private sector, and other institutions.

The second cluster emphasizes accountability in e-government and public administration. Keywords related to this cluster include "accountability", "e-government", "electronic government", and "public administration". Research in this cluster focuses on how digital technology can strengthen transparency and accountability in government. Implementing an information-based system enables better monitoring and more open decision-making, which in turn improves the quality of public services. The concept of e-government in this cluster leads to more efficient and responsive governance that meets community needs. In this regard, accountability becomes a key factor, as technology can help governments more easily report and explain their policies and programs to the public. This cluster analysis reveals two main research focuses related to smart cities and e-government. The first cluster highlights the crucial role of communication technology in improving the efficiency of government services. In contrast, the second cluster emphasizes the importance of accountability and transparency in public administration achieved through technology implementation. These two areas reflect the need to develop governance that is more transparent, efficient, and responsive, where technology serves not only to improve services but also to strengthen the relationship between the government and society. Thus, research in both clusters plays a very important role in creating better smart cities and more responsible governments.

Author collaboration roadmap

Author collaboration analysis provides an overview of the intellectual and collaborative structure underlying research on smart cities and government service development. By examining co-authorship relationships, this analysis identifies how researchers are connected through joint publications and reveals authors or research groups that occupy relatively central positions within the collaboration network. The network can also show the extent to which smart city and e-government research is developed through collaborative and interdisciplinary efforts. Figure 5 presents the author collaboration network.

This network diagram of author collaboration provides a clear picture of how collaboration works in smart city and e-government research. Wang W., as the central author, facilitates the connections between other authors, each contributing ideas and methodologies. This collaboration is crucial in developing complex topics like e-government, where solutions to digital governance challenges and the use of communication technologies require expertise from various fields. This kind of research highlights the importance of collaboration among authors in producing high-quality scientific work that is relevant to societal needs and technological advancements.

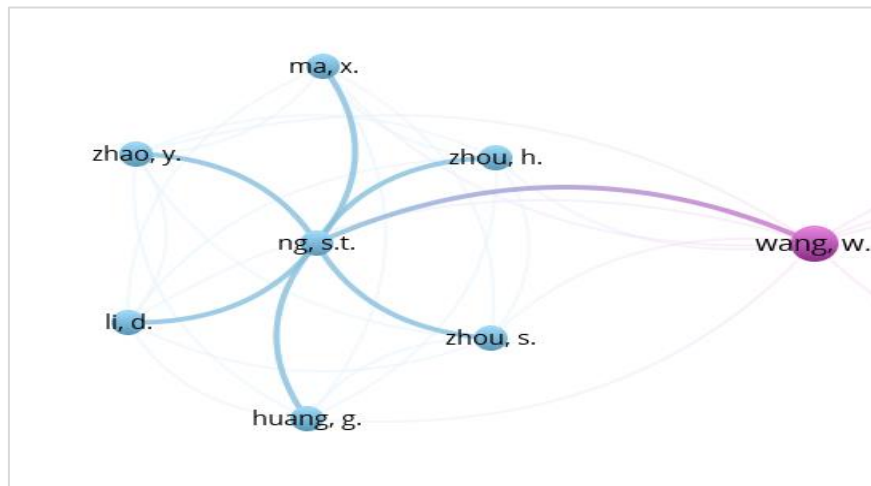


Figure 5 author collaboration
Source: secondary data, processed

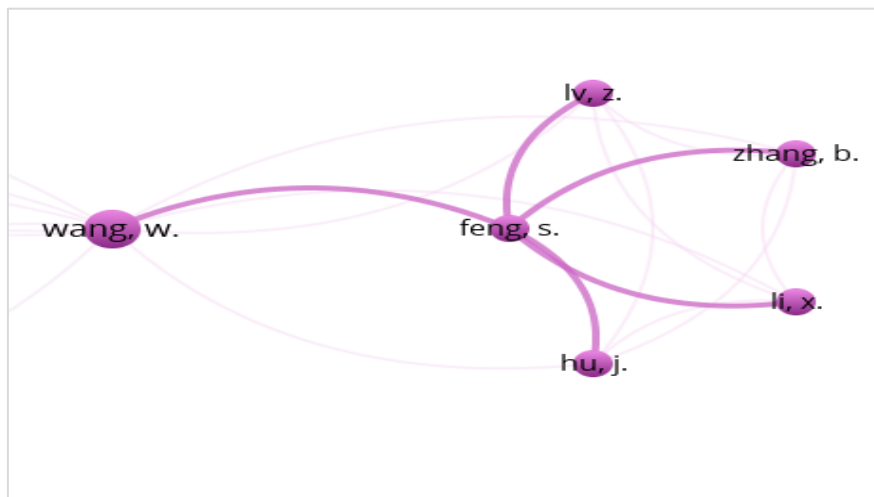


Figure 6 author collaboration
Source: secondary data, processed

Figure 6 illustrates the network of author collaborations in research on smart cities and e-government, where each point represents an author and the lines connecting the points indicate collaborative relationships between authors. This network analysis provides a deeper understanding of author collaboration and how these relationships influence research development in this field. The collaboration among authors in this network shows that smart city and e-government research is becoming more multidisciplinary, with authors from different backgrounds working together toward a shared goal. Although some authors, such as Li X. and Hu J., have more limited connections within this network, their collaboration with the lead authors suggests they contributed their ideas and approaches to the research. Li X. and Hu J. may have focused on specific aspects of smart technology implementation or governance, enriching the research with their specialized expertise.

This author network provides a clear picture of the importance of cooperation in smart city and e-government research, as also found by Lv et al. (2018) regarding innovative approaches and website evaluation. It functions as the central writer in this network, connecting various authors who contribute to the development of a highly multidisciplinary topic. Collaboration among authors from diverse academic

backgrounds enriches research, broadens insights, and helps generate innovative, practical solutions in digital governance and smart city management. This analysis confirms that smart city research requires not only the involvement of technology experts but also the integration of various disciplines to create more efficient, transparent, and responsive governance.

Discussion

The findings of this study demonstrate that research on smart cities and government service development has evolved into a multidisciplinary field in which technological innovation, digital governance, public administration, stakeholder engagement, and service quality are increasingly interconnected. The bibliometric analysis covering 2015 to 2025 shows that the literature has moved beyond an initial emphasis on technological infrastructure toward broader questions about how digital technologies can transform government services and generate public value. The dominance of Computer Science, followed by Engineering and Social Sciences, reflects the technological foundation of smart city development while simultaneously demonstrating the growing importance of institutional and societal dimensions. The keyword network further confirms this development through the strong relationships among “government service,” “e-government,” “communication technology,” “accountability,” “public administration,” and “stakeholder.” These findings suggest that smart city development should no longer be understood merely as the deployment of advanced technologies, but rather as an integrated process of digital transformation involving technology, institutions, government, and society.

Smart city as a driver of government service transformation

One of the central findings of this study is the strong relationship between smart city development, e-government, and government service delivery. The prominence of keywords such as “government service,” “e-government,” and “communication technology” indicates that digital transformation has become an important mechanism for improving the accessibility, efficiency, and responsiveness of public services. This finding is consistent with Lv et al. (2018), who developed a government affairs service platform for smart cities to support government services and operational monitoring across different urban sectors. Their research demonstrates that integrated digital platforms can connect multiple government functions and support the management of complex urban problems, including disaster management, environmental protection, intelligent transportation, and urban resource monitoring.

Advances in artificial intelligence, cloud computing, and personalized digital services also support the development of digital government services. Al-Besher & Kumar (2022) demonstrate the potential of artificial intelligence to enhance e-government services, particularly by improving the efficiency and capabilities of digital government systems. Similarly, Ng (2018) emphasizes the strategic importance of cloud computing in Singapore's development as a smart nation, highlighting the role of scalable digital infrastructure in supporting government transformation. These findings complement the bibliometric results of this study by demonstrating that technological infrastructure, intelligent systems, and digital platforms form the foundation upon which smart city government services can be developed.

The literature also indicates that the transformation of government services increasingly focuses on service personalization and user experience. Lin (2022) emphasizes developing recommender systems for government services in the smart city

context, suggesting that digital government can move toward more personalized, user-oriented service delivery. Furthermore, Li et al. (2025) examine the usability of government portal websites in pilot smart cities, demonstrating the importance of evaluating how citizens interact with digital government platforms. These findings suggest that the success of digital transformation should not be assessed solely based on the existence of technological infrastructure or the number of digital services available. Instead, service usability, accessibility, personalization, and citizens' experiences should become important indicators of smart government performance.

From technology-centered smart cities to governance-oriented smart government

An key contribution of the present study is identifying accountability, e-government, electronic government, and public administration as a distinct research cluster. This finding indicates that the literature has increasingly expanded from technological implementation toward the governance consequences of digital transformation. Technology is no longer viewed merely as an instrument for automating administrative processes; it is increasingly examined as a mechanism for strengthening transparency, accountability, institutional coordination, and public participation.

This finding is supported by Lytras & Șerban (2020), who demonstrate the importance of e-government in smart city research and emphasize the role of regulations in shaping digital transformation within the European Union. Their study indicates that appropriate regulatory and institutional frameworks must support technological innovation to ensure that digital government contributes effectively to smart city development. Similarly, Nielsen & Millard (2020) argue for e-government assessment approaches that account for local contexts rather than relying exclusively on standardized global benchmarks. This perspective is particularly relevant because governments' digital maturity is influenced by differences in institutional capacity, infrastructure, socioeconomic conditions, and societal needs.

The findings of Debeljak & Dečman (2022) provide further support for this interpretation. Their quantitative assessment of Slovenian urban municipalities indicates that municipality population size does not necessarily determine overall digital maturity, although it can affect specific dimensions of digital transformation. This finding suggests that smart city development cannot be explained simply by a city's size or economic scale. Instead, the quality of digital transformation depends on the interaction of organizational capabilities, technological readiness, institutional arrangements, and strategic priorities. Therefore, governments should develop digital strategies adapted to local conditions rather than applying uniform smart city models across municipalities.

Accountability, transparency, and institutional capacity

The emergence of accountability as a key keyword in the research network is particularly significant. It shows that digital transformation is increasingly linked to questions of transparency, responsibility, and public trust. Digital systems can create opportunities for governments to provide information more efficiently, monitor administrative processes, document government activities, and establish channels for citizens to evaluate or provide feedback on public services. Consequently, smart government can potentially strengthen the relationship between government institutions and citizens when technological systems are designed and managed according to principles of transparency and accountability.

However, technology itself does not automatically guarantee accountable governance. The benefits of digital government depend on institutional capacity, regulatory frameworks, data governance, and public institutions' willingness to use technology responsibly. Lytras & Şerban (2020) emphasize the relevance of regulations in the relationship between e-government and smart city development, reinforcing the argument that institutional arrangements must develop alongside technological innovation. This finding matters because a technologically advanced city may still face governance problems if digital systems lack adequate accountability mechanisms, clear responsibilities, or appropriate regulatory safeguards.

The research by Stamatiou et al. (2023) strengthens this argument by emphasizing security and privacy in developing a flexible smart city platform. Their proposed platform aims to provide a secure, privacy-oriented environment for civic engagement and digital service delivery. This demonstrates that trust is becoming an important component of digital government. Citizens are more likely to use digital government services when they perceive that their personal information is protected and that government platforms are reliable and secure. Thus, accountability in smart government should be understood broadly to include not only administrative responsibility but also data protection, cybersecurity, transparency in technology use, and responsible management of citizens' information.

Citizen participation and stakeholder engagement

The presence of “stakeholder” within the first research cluster indicates that smart city development is increasingly understood as a collaborative process involving multiple actors. Governments cannot independently develop effective smart city ecosystems because digital public services require interaction among citizens, government agencies, private technology providers, academic institutions, and other organizations. Stakeholder engagement is therefore an important mechanism for ensuring that technological solutions correspond to actual public needs. This interpretation is consistent with Boon et al. (2020), who examine participation in e-government services and smart city programs and emphasize public engagement within the smart city framework. Their findings reinforce the importance of involving citizens in developing and evaluating digital government initiatives. Similarly, Ulrich et al. (2020) highlight the importance of understanding user preferences in the co-production of IoT-enabled e-services, indicating that citizens should not be viewed merely as passive recipients of digital services but as participants in the service development process.

The Indonesian context provides an additional illustration of this citizen-oriented approach. Jumroh et al. (2024) found that social media technology can support the delivery of public services and contribute to user-centered, transparent, and environmentally aware services within Indonesian local government. This finding demonstrates how relatively accessible digital platforms can facilitate communication between governments and citizens without requiring highly complex technological infrastructures. Consequently, smart city development should include not only sophisticated technologies but also communication mechanisms that enable citizens to express their needs, provide feedback, and participate in governance processes.

Digital inclusion, security, and the risks of smart city development

Although the findings show substantial opportunities in smart city development, they also reveal several persistent challenges. One of the most important is the digital

divide, which can limit the equitable distribution of digital government benefits. Differences in internet access, digital literacy, socioeconomic conditions, geographic location, and technological infrastructure can prevent certain groups from fully benefiting from digital public services. Consequently, expanding digital government does not automatically guarantee greater social inclusion. This issue matters because the success of smart city initiatives should be evaluated not only by technological sophistication but also by their ability to provide equitable access to public services. If digital services become the primary channel for accessing government assistance, administrative services, healthcare, education, or other public services, citizens who lack adequate technological access may become increasingly marginalized. Therefore, digital transformation policies should be accompanied by measures to improve infrastructure, digital literacy, accessibility, and alternative service channels for populations that remain digitally excluded.

A second major challenge concerns data security and privacy. Smart city ecosystems depend heavily on collecting, integrating, and analyzing large quantities of data. While these data can improve government decision-making and service personalization, they also create risks associated with unauthorized access, misuse, cyberattacks, and inappropriate data sharing. The emphasis on citizen security and privacy in the work of Stamatiou et al. (2023) illustrates the increasing importance of these issues in smart city platform development. Similarly, the security challenges associated with interoperability and digital service integration show that smart city systems must be designed with appropriate mechanisms to protect information and maintain service continuity. These challenges indicate that developing smart city government services requires a balance between innovation, efficiency, inclusion, and protection. Governments should avoid an overly technology-centric approach that prioritizes rapid digitalization without sufficient consideration of its social and ethical consequences. Instead, smart government strategies should incorporate privacy-by-design, cybersecurity, inclusive service design, transparent data governance, and continuous evaluation.

Government programs and the practical context of smart city development

This study's findings are also relevant to government programs aimed at accelerating digital transformation and smart city development. In Indonesia, for example, smart city initiatives have encouraged the use of digital technologies in areas such as public services, transportation, environmental management, and urban administration. The bibliometric findings indicate that these initiatives correspond closely with the dominant themes identified in the international literature, particularly the integration of communication technologies, e-government, government services, accountability, and stakeholder participation. Pribadi et al. (2023) further support the Indonesian context by identifying factors influencing citizens' use of smart government services in Indonesia. Their findings indicate that user satisfaction, service innovation, and perceived cost are important factors that can influence public trust and willingness to use smart government services. This finding highlights an important practical implication: technological availability alone is insufficient to ensure adoption. Citizens must perceive digital services as useful, affordable, reliable, and able to address their needs. The findings of Boon et al. (2020) and Ulrich et al. (2020) reinforce this perspective by demonstrating the importance of participation and user preferences in digital government and e-service development. Therefore, government programs should move beyond a supply-oriented model in which governments simply provide digital

platforms. Instead, smart city services should be developed through continuous interaction with citizens and other stakeholders, including systematic mechanisms for feedback, evaluation, and service improvement.

Theoretical implications and research gap

From a theoretical perspective, the findings support an understanding of smart city development as an integrated socio-technical and governance system. The bibliometric evidence shows that technology-related concepts remain central, but they are increasingly linked to public administration, accountability, stakeholder engagement, and citizen-oriented services. This suggests that smart city research can benefit from integrating technological perspectives with theories of digital governance, public value, institutional capacity, citizen participation, and service co-production. The research also identifies an important gap in the existing literature. Previous studies have frequently examined specific technological solutions, individual government platforms, particular cities, or specific dimensions of digital transformation. For example, Lv et al. (2018) focus on a government affairs service platform, Al-Besher & Kumar (2022) examine artificial intelligence for e-government services, Ng (2018) discusses cloud computing in Singapore, and Li et al. (2025) examine government portal usability. These studies provide valuable insights into particular technological or service dimensions. However, they do not, individually, provide a comprehensive picture of how the research field itself has developed across a decade or how technological, governance, and societal themes have become interconnected. This study addresses that gap by examining the research landscape from 2015 to 2025 through a bibliometric perspective. Rather than focusing on a single city, technology, or government program, the study maps publication trends, contributing countries, journals, authors, subject areas, keyword networks, thematic clusters, and author collaboration patterns. This broader perspective makes it possible to identify the field's evolution and determine which themes have become central, which disciplines dominate the literature, and how research communities have developed over time.

Novelty and contribution of the study

The novelty of this study lies primarily in its effort to integrate the technological, governance, and societal dimensions of smart city and government service research within a single longitudinal bibliometric analysis. The findings demonstrate that smart city research is not developing along a single technological trajectory. Instead, it is characterized by interactions among communication technologies, e-government, public administration, accountability, stakeholder engagement, and citizen-oriented service delivery. A second contribution is identifying two dominant thematic clusters: the first concerns communication technology, e-governance, government services, and stakeholders, and the second concerns accountability, e-government, electronic government, and public administration. The coexistence of these clusters demonstrates that the future development of smart government requires technological innovation to be accompanied by institutional and governance reforms. This finding provides a conceptual basis for moving from a technology-centered smart city paradigm toward a more integrated and accountable smart government framework. A third contribution identifies emerging research directions. Based on the patterns identified in the literature, future research is likely to increasingly address artificial intelligence, personalized government services, cybersecurity, privacy, interoperability, data governance, citizen participation, and user-centered service design. These areas could

connect the technological foundations of smart cities with the governance and societal dimensions identified in the present study.

Conclusion

This study concludes that research on the relationship between smart cities and government service development has grown significantly and become increasingly multidisciplinary during 2015–2025. The bibliometric analysis reveals that publication activity fluctuated throughout the decade, with the highest number of publications recorded in 2020, while Indonesia and China emerged as the countries with the largest contributions. Computer science, engineering, and social sciences were the dominant subject areas, reflecting the strong technological foundation of smart city research and the increasing importance of social and governance perspectives. Keyword network and cluster analysis identified two major research themes: communication technology, e-governance, government services, and stakeholder engagement; and accountability, e-government, electronic government, and public administration. These findings indicate that the research field has developed from a predominantly technology-oriented perspective toward a more integrated approach that combines digital innovation with governance, accountability, stakeholder participation, and citizen-oriented public services.

The study contributes to the literature by providing a longitudinal bibliometric overview of smart city and government service research from 2015 to 2025, identifying publication trends, leading countries, relevant journals, influential authors, subject areas, collaboration networks, and dominant research clusters. The findings demonstrate that successful smart city implementation requires more than technological infrastructure; it also depends on institutional capacity, accountability, stakeholder involvement, citizen needs, data security, privacy, and service quality. These findings have practical implications for policymakers by emphasizing the need to develop context-specific, inclusive, citizen-centered smart city strategies supported by appropriate governance mechanisms. However, this study has several limitations, particularly its reliance on the coverage and classification of a single bibliographic database and the limitations of bibliometric methods in explaining the substantive quality, contextual differences, and real-world effectiveness of individual smart city initiatives.

Future research should address these limitations by combining bibliometric analysis with systematic literature reviews, qualitative research, comparative case studies, and empirical investigations. Further studies should expand database coverage and examine emerging technologies and issues, including artificial intelligence, blockchain, Internet of Things, interoperability, cybersecurity, data privacy, digital inclusion, and personalized government services. Comparative research across countries and municipality types is also needed to examine how institutional capacity, infrastructure, regulation, digital literacy, and socioeconomic conditions influence smart government outcomes. In addition, future research should place greater emphasis on citizen-level outcomes, including digital service adoption, satisfaction, trust, accessibility, and perceived public value. Such research would provide a more comprehensive understanding of whether technological transformation actually produces government services that are efficient, transparent, accountable, inclusive, secure, sustainable, and responsive to citizens' needs.

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