

## Research Article

# The Impact of Electronic Identity Cards and the Digitalization of Certificates on Public Service Effectiveness: A Literature Review

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## Abstract.

This study presents a systematic literature review and mapping of 21 selected academic publications from 2015 to 2025, focusing on the digitalization of public services through the implementation of electronic identity cards (e-KTP) and digital certificates. The objective was to explore how digital transformation affects the effectiveness of public administration, particularly in service delivery, transparency, and civil servant (ASN) performance. The findings highlight five key thematic areas: (1) the widespread adoption of digitalization in public services; (2) significant improvements in service efficiency and transparency; (3) multidimensional challenges to implementation, including infrastructural limitations, low digital literacy, and institutional resistance; (4) the essential role of e-governance and community e-readiness in enabling participatory and accountable systems; and (5) the positive, yet conditional, impact on ASN performance. A bibliometric analysis using VOS viewer revealed three dominant research clusters: technology-driven transformation, governance reform and public participation, and civil service capacity building. This study contributes to identifying emerging gaps, particularly in areas such as digital inclusion, ethical governance, and algorithmic oversight, and proposes strategic recommendations for future policy design and research. The results underscore the importance of an integrated, inclusive, and ethically grounded approach to digital public service innovation.

**Keywords:** digitalization, e-KTP, digital certificate, civil servant services

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## 1. Introduction

The digitalization of public administration—particularly through the implementation of Electronic Identity Cards (e-KTP) and digital certificates—has become a cornerstone in the modernization of governance systems. These technologies have contributed to simplifying bureaucratic procedures, minimizing face-to-face interactions, and enhancing the efficiency, transparency, and accessibility of public services[1]. In the case of digital identity such as e-KTP, this shift represents a broader transformation from closed bureaucratic models toward open, data-driven, and participatory governance[2]. In regions such as Eastern Europe, digitalization is also viewed as a strategic tool for



supporting European Union accession through enhanced transparency and inclusive digital governance frameworks[3].

The implementation of digital identity platforms such as Indonesia's IKD and integrated administrative systems in Romania has demonstrated their ability to strengthen legal certainty, accelerate service delivery, and expand citizen access[4]. However, the success of such initiatives largely depends on infrastructure readiness, digital literacy, and interagency collaboration[5]. Recent studies stress the importance of user-centered design and institutional reform to ensure responsiveness and inclusivity in digital public services[6]. At the local level, cities like Makassar have shown progress through digital initiatives such as The Missing Capil and API-based services offered by the civil registration office, which have improved service delivery efficiency and shaped positive public perceptions[7].

Despite the growing implementation of digital systems, structural and cultural barriers continue to hinder the full realization of their benefits. Unequal digital infrastructure, limited digital competence among civil servants and citizens, and institutional resistance remain persistent challenges[8]. Moreover, much of the existing research focuses on the administrative and technical aspects of digitalization, while fewer studies systematically assess its impact on civil servant (ASN) performance and public satisfaction with services. Given that digital innovations such as e-KTP and digital certificates are expected to directly enhance public sector efficiency and trust, this presents a significant gap in the current literature[9].

In response to the identified gaps in the literature, this study aims to systematically examine the impact of digital public service implementation—specifically through the use of e-KTP and digital certificates—on the performance effectiveness of civil servants at the Department of Population and Civil Registration (Dukcapil) in Makassar City. To achieve this objective, the research adopts a Systematic Literature Review (SLR) approach complemented by bibliometric analysis. The integration of bibliometric mapping serves as a complementary methodological strategy within the SLR framework. It facilitates a quantitative examination of scholarly output, allowing for the identification of dominant themes, influential authors, key research clusters, and the evolution of discourse related to digital public service innovation.

This approach contributes to bridging the research gap in two critical ways. First, it uncovers structural patterns within both global and national academic landscapes that are often overlooked in narrative-based reviews—particularly on underexplored

aspects such as the influence of digital identity systems on civil servant performance and public trust. Second, it offers empirical insights into the lack of scholarly attention toward outcome-based evaluations, such as administrative efficiency, user satisfaction, and service transparency, in the context of e-KTP and digital certificate implementation. By combining SLR and bibliometric analysis, this study not only enhances the analytical rigor of the review process but also systematically identifies blind spots and strategic directions for future inquiry. Ultimately, the research provides a more holistic understanding of public administration digitalization and offers practical insights for designing inclusive, adaptive, and sustainable digital public service systems.

## 2. Research Methodology

This study adopts a qualitative research approach through a Systematic Literature Review (SLR) to explore the impact of e-KTP and digital certificate digitalization on the effectiveness of civil servant (ASN) services at the Population and Civil Registration Office (Dukcapil) in Makassar City. The SLR method is chosen to gather, evaluate, and synthesize relevant studies systematically and transparently, thereby ensuring the reliability and validity of the findings.

To complement the systematic review, a bibliometric analysis was conducted to identify trends, influential authors, research clusters, and thematic developments related to digital identity systems and public service effectiveness. Bibliometric methods allow researchers to quantitatively map the structure of knowledge within a research domain.

### **Data Collection**

Data were collected from reputable national and international journal databases, including Scopus, Web of Science, Google Scholar, Garuda, and DOAJ, using specific search strings such as:

“e-KTP”

“digital certificate”

“digital identity”

“civil registration digitalization”

“public service effectiveness”

“Dukcapil”

The inclusion criteria for selecting articles were:

1. Published between 2018 and 2024.
2. Peer-reviewed journal articles, conference papers, or official government publications.
3. Focus on digitalization in civil registration or public service delivery.
4. Written in English or Bahasa Indonesia.

Exclusion criteria included duplicated studies, articles with inaccessible full texts, and studies unrelated to the Indonesian administrative context.

## 2.1. Data Analysis

The selected articles were analyzed in two stages:

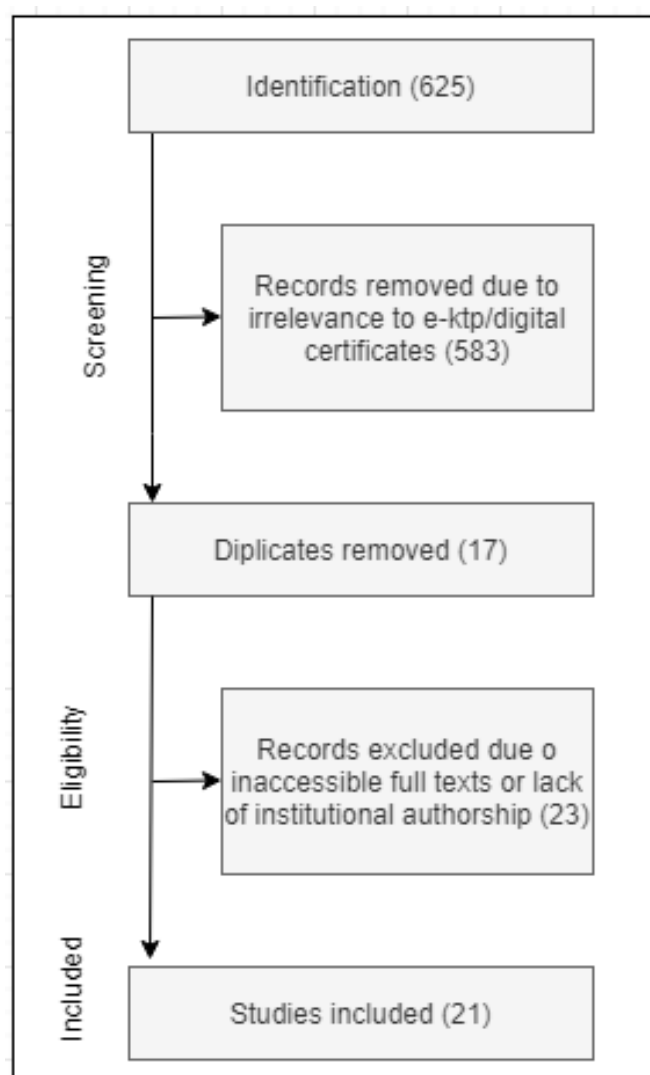
1. Thematic Content Analysis: to interpret qualitative themes related to the impact of digitalization on service effectiveness, focusing on aspects such as service speed, administrative burden, transparency, and citizen satisfaction.
2. Bibliometric Mapping: performed using VOSviewer software to visualize co-occurrence networks of keywords, authorship collaboration, and citation trends. This helped in identifying dominant research areas and potential knowledge gaps.

## 2.2. Research Focus

The review is structured around the following key research questions:

1. How has the digitalization of e-KTP and digital certificates affected the effectiveness of ASN services at Dukcapil?
2. What are the key opportunities and challenges identified in the literature regarding digital transformation in civil registration services?
3. What thematic trends emerge in the global and national academic discourse on public service digitalization?

Based on the results of the article analysis regarding the impact of digitalization on the effectiveness of public services through the PRISMA flowchart, the following findings were obtained:



**Figure 1:** PRISMA flowchart.

Based on chart 1, the review of the 21 selected articles, the distribution of publications by year indicates that 2024 and 2023 were the most productive years, each contributing 6 articles (28.6%), followed by 2020 with 4 articles (19%), 2021 with 3 articles (14.3%), and one article each in 2022 and 2025. In terms of journal sources, the articles were published in a variety of reputable national and international journals. Some journals appeared more than once as sources of selected articles, such as:

1. Proceedings of the International Conference PICBE, which featured two articles authored by Goldbach, Popa, & Paraschiv (2024).
2. Meanwhile, other journals such as Technology in Society, Digital Policy, Regulation and Governance, Jurnal Bina Praja, Applied Sciences, Economic and Social Development, Public Administration Issues, Public Administration and Civil Service

Review, Journal of Open Innovation, and Revista Inclusiones each published only one article.

Articles originating from Indonesian national journals include:

1. Jurnal Bina Praja [10].
2. Jurnal Kependudukan Indonesia [11]
3. Jurnal Administratie dan Kebijakan Publik [12]

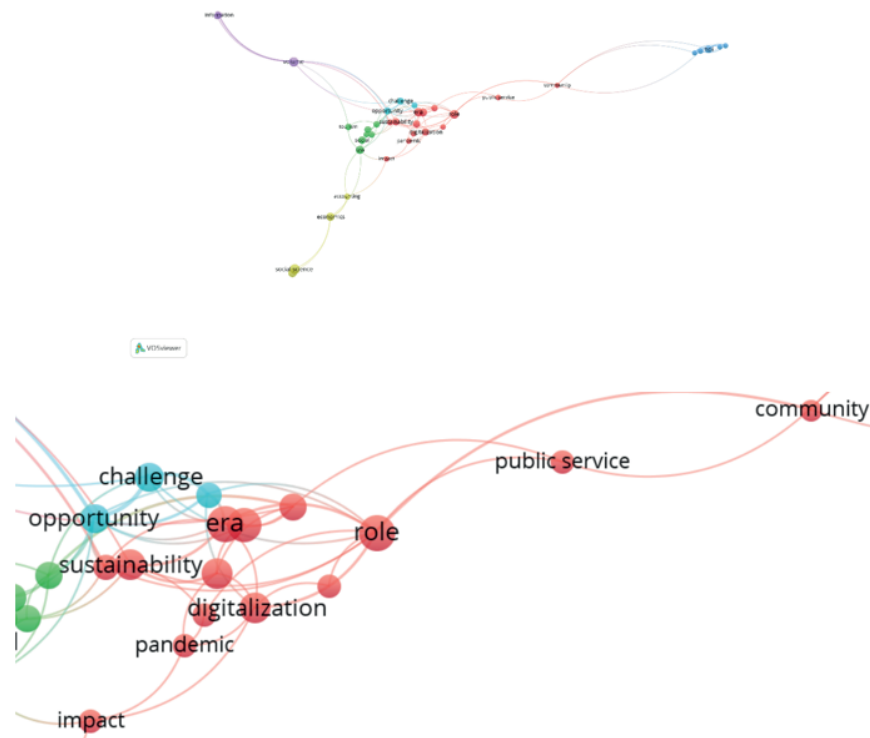
This indicates that the topic of public service digitalization, particularly in relation to e-KTP and digital certificates, has gained significant attention in various academic forums and has been consistently published in both national and international journals over the past decade (2015–2025).

### 3. Discussion

Based on the analysis of 21 scholarly articles focusing on the topic of public service digitalization, particularly in relation to the implementation of e-KTP and digital certificates, a consistent thematic pattern was identified. The majority of these studies emphasize that the digitalization of population identity systems and civil documents serves as a strategic component of administrative reform, aimed at improving service efficiency, accelerating access, and strengthening transparency and bureaucratic accountability as demonstrated in the results of the bibliometric analysis using VOSviewer (Figure 1).

The bibliometric mapping using VOSviewer software, based on co-occurrence keywords from literature on public service digitalization, reveals the emergence of several dominant clusters. The red cluster, located at the center of the map, highlights key terms such as “digitalization,” “public service,” “role,” “impact,” and “pandemic.” This indicates that scholarly discussions generally focus on the role of digitalization in transforming public services, with the COVID-19 pandemic serving as a significant catalyst in accelerating this transformation.

The mapping results further illustrate that research on public digitalization spans across multiple domains including social, economic, legal, and technological perspectives emphasizing the interdisciplinary nature of this field. These findings reinforce the relevance of integrating cross-sectoral approaches to fully understand the multifaceted impact of digital transformation in public services, particularly in relation to the implementation of e-KTP and digital certificates.



**Figure 2:** Bibliometric by Vosviewer.

Additionally, the literature highlights the critical role of digital infrastructure readiness, human resource capacity, and citizen engagement as key determinants of successful implementation of inclusive and sustainable digital service systems. These findings suggest that despite variations in context and methodological approaches, there is a strong consensus that e-KTP and digital certificates play a pivotal role in advancing more responsive, data-driven models of public governance. The indicators identified in the previous findings include:

### 3.1. Digitalization in Public Services

The integration of digital tools in public administration, such as e-KTP and digital certificates, is part of a broader trend to modernize governance and improve service delivery. According to the World Bank (2018), digital identification systems, including e-KTP, are fundamental for ensuring secure, verifiable, and efficient access to services. These tools provide citizens with faster and more accessible ways to interact with government agencies. Furthermore, the digitalization of birth, marriage, and death certificates by the Directorate General of Population and Civil Registration (Dukcapil) represents a critical step in Indonesia's e-governance strategy.

The review findings indicate that digitalization in public services has become a central element in the transformation of government administration across various countries. Most articles emphasize that digitalization is used as a key instrument for modernizing public administration, focusing on enhancing the efficiency, transparency, and accessibility of services.

Several studies, including those by [13] highlight that digitalization can promote technology- and data-driven governance, creating a more efficient and innovative public service ecosystem. This transformation is evident in the shift from manual systems to digital platforms, as illustrated by [14] in the case of the M-PASPOR who reference the use of e-government indicators across the European Union.

In the Indonesian context [11] demonstrate the implementation of the Digital Population Identity (IKD) as a digital service based on the National Identification Number (NIK), which facilitates access to official documents. This aligns with [15] who note that online platforms help accelerate service processes.

Nevertheless, challenges also arise in terms of integrity and governance, as raised by who underscore the potential for conflicts of interest in the implementation of e-KTP. This issue highlights the need for a regulatory framework and bureaucratic ethics to accompany digital transformation.

Several studies propose specific approaches, such as:

1. Through a technology-cluster-based approach [16];
2. Who emphasize cryptography for data security [17]; and
3. Who views digitalization as an expansion of e-democracy [18].
4. Studies such as those by [19] underline that digitalization must also be inclusive and serve as a bridge for two-way interaction between the government and the public, rather than merely automating bureaucratic processes.

The findings from the selected studies offer unique and complementary perspectives on the digitalization of public services, particularly concerning the implementation of e-KTP and digital certificates. Introduce a technology-cluster-based approach, which highlights the importance of integrating multiple digital tools such as biometric authentication, service interoperability, and cloud-based systems as a cohesive ecosystem to support public service delivery[20]. This approach is highly relevant to the Indonesian e-KTP system, where synergy between various technological components is essential



for functionality and scalability. Emphasize cryptographic security, underscoring the critical role of encryption in safeguarding personal data within digital identity systems. Their perspective is especially pertinent for e-KTP and digital certificates, which store sensitive demographic and civil registration data that must be protected against cyber threats to maintain public trust.

Meanwhile, [21] presents a more normative view by framing digitalization as a vehicle for expanding e-democracy. Rather than limiting digital systems to efficiency gains, she argues that initiatives like e-KTP should foster greater civic participation and transparency, thereby redefining the relationship between the government and its citizens. Additionally highlight the necessity of designing digital systems that are inclusive and dialogic. They argue that tools like e-KTP and digital certificates should not merely replicate traditional bureaucracy in digital form but should enable two-way interaction, empowering citizens as active participants in governance rather than passive service recipients.

Taken together, these studies suggest that the success of digital identity initiatives depends not only on technical efficiency but also on ethical design, inclusive engagement, and secure infrastructure dimensions that are critical for assessing the broader impact of e-KTP and digital certificate implementation on public service effectiveness. Digitalization in public services is not solely about adopting technology, but also involves structural reform, ethical governance, data protection, and citizen empowerment. Challenges and local contexts must be taken into account for digitalization to truly improve the quality of public service delivery.

### **3.2. Enhancing Service Efficiency and Transparency**

A key focus of digital transformation is improving service efficiency. [22] highlight that the implementation of e-KTP and digital certificates has streamlined bureaucratic processes by reducing paperwork and manual data entry, which in turn reduces delays and improves service quality. In Makassar City, studies have shown that the integration of these digital tools has led to improved performance of civil servants, reducing redundancies, minimizing human error, and fostering greater transparency in service delivery.

In general, digitalization has significantly contributed to enhancing the efficiency of public services and government transparency. Most articles assert that the adoption of

digital technology can accelerate service delivery, reduce costs, and improve accountability and public access to information.

Several studies, such as those by Febiri et al. [23], Dobrolyubova [24], and Kuanaliyev [25], explicitly demonstrate that digitalization expedites service processes and automates administrative procedures, thereby reducing the potential for abuse of power and increasing service provider accountability. Similarly, the study by Pūraitė et al. [26] affirms that digitalization helps lower operational costs and enhances public participation in the oversight of public services.

The synthesis of findings reveals that the implementation of digital identity systems such as e-KTP and digital certificates contributes significantly to enhancing efficiency, transparency, and accessibility in public services, particularly when supported by robust information infrastructure. Studies emphasize that improved access to digital information systems not only accelerates bureaucratic decision-making but also fosters greater citizen participation, which is vital in democratic governance contexts. In line with this demonstrate how digitized platforms enhance tax compliance, suggesting that similar systems linked to population administration—like e-KTP—could improve accountability and fiscal performance in public sectors.

However, geographic and institutional realities, especially in decentralized governance settings like Indonesia, introduce risks of political misuse and uneven implementation. Warn that digital reforms may be co-opted for personal or factional interests, while highlights the vulnerability of digital systems to manipulation and erosion of public trust—issues that are particularly concerning when personal data linked to civil identity is involved. These insights are critical for countries where e-KTP and similar programs are implemented in environments marked by varying levels of oversight and legal enforcement.

To mitigate these risks and reinforce public service outcomes, several studies recommend integrating advanced technologies and accountability tools. Advocate for cryptographic methods to secure identity data, whereas underscores the use of digital reporting mechanisms like e-invoicing to improve transparency in resource management. In the Indonesian context [4] show how platforms like IKD and M-PASPOR are strategically deployed to reduce bureaucratic friction and prevent opportunities for corruption by minimizing in-person interactions. Complementing these approaches introduce a data envelopment analysis (DEA) model that allows policymakers to quantitatively assess

digital service efficiency, providing a basis for more evidence-based and regionally sensitive policy decisions in public administration reform.

Overall, findings from various countries demonstrate that digitalization has proven effective in accelerating services and strengthening transparency. However, its success largely depends on system design, infrastructure readiness, and the ethical conduct of service providers. Therefore, digital strategies must be designed based on principles of inclusivity, technological reliability, and strong public oversight.

### **3.3. Challenges to Digital Service Implementation**

While digital transformation presents numerous benefits, challenges persist in its implementation. Research Mursitama [27] indicates that digital infrastructure disparities, limited digital literacy, and resistance to change remain significant barriers. For instance, civil servants may lack the skills to fully utilize digital tools, while citizens may be unfamiliar with digital processes, leading to delays or inefficiencies. The importance of public satisfaction in assessing the success of e-KTP services, noting that the success of digital systems is dependent on both the proficiency of government officials and the preparedness of the community to engage with digital services.

The challenges in implementing digital services are highly complex and multidimensional, encompassing technical, structural, social, and political aspects. Most of the identified barriers are related to infrastructure disparities, low levels of digital literacy, and institutional resistance. Digital divide between regions and the lack of adoption of online services as major obstacles to the equitable distribution of digital public services. These issues are reinforced by the findings of [12] who note the limitations in device availability and the accessibility of digital services for low-income communities or those with limited technological skills.

Bureaucratic and institutional resistance emerges as another significant challenge. This is emphasized by [13] who report internal resistance within government institutions to digital change, in addition to fragmented authority across agencies and weak synergy in developing integrated systems.

Issues related to data security and digital ethics are also frequently discussed. Risks such as privacy violations, algorithmic bias, and the lack of cybersecurity training among civil servants[15]. These findings suggest that digitalization without robust security systems may introduce new vulnerabilities in public service delivery. Moreover, the

lack of public participation in the formulation and evaluation of digital services is another recurring challenge. They emphasize that digital democratization must involve active community engagement, rather than treating technology adoption as a mere administrative formality. From a policy perspective, underline the absence of evaluative indicators and outcome-based measurements, as well as the lack of global standards for assessing the effectiveness of digital transformation.

In general, the challenges in implementing digital services can be classified into five main categories:

1. Technology and Infrastructure – including limited access to devices, networks, and reliable systems.
2. Human Resource Capacity – such as gaps in digital skills and the lack of technical training.
3. Structure and Regulation – including institutional fragmentation, bureaucratic rigidity, and weak intersectoral coordination.
4. Digital Security and Ethics – covering privacy concerns, algorithmic bias, and data vulnerability.
5. Participation and Public Awareness – characterized by low levels of public engagement and insufficient digital service education.

The success of public service digitalization through e-KTP and digital certificates is significantly influenced by five key dimensions, which reflect challenges across different geographical and policy contexts. In Indonesia, the Technology and Infrastructure dimension poses a major barrier, particularly in remote areas that still suffer from limited internet connectivity, lack of digital devices, and the absence of a fully integrated national information system. This contrasts with more advanced European countries like Estonia or Romania, where digital infrastructure is more evenly distributed, allowing for stable implementation of e-ID and e-certificate systems that support efficient cross-sectoral services.

In terms of Human Resource Capacity, Indonesia faces a notable gap in digital skills among both civil servants and the general public. Many government officials have yet to receive adequate technical training to manage digital-based administrative systems. This differs from countries like Lithuania or Finland, where digital training is systematically incorporated into public sector reform policies. The lack of investment in

capacity building in Indonesia has hindered the full realization of digital transformation goals.

From the Structure and Regulation perspective, Indonesia continues to experience institutional fragmentation between ministries and local governments. Overlapping and misaligned regulations often create coordination problems and hinder system interoperability. In contrast, European Union member states have adopted interoperability policies and standardized e-government systems as part of their cross-sectoral digital strategies.

Meanwhile, Digital Security and Ethics is a global concern with localized implications. In Indonesia, issues surrounding data privacy and the potential misuse of personal information in the e-KTP system frequently surface, particularly due to the late adoption of comprehensive data protection laws. This differs from countries such as Germany or the Netherlands, which have embedded principles like privacy by design and algorithmic accountability into their digital governance frameworks.

Finally, under the Participation and Public Awareness dimension, citizen engagement with digital services in Indonesia remains relatively low, especially in areas with limited digital literacy. Public education and outreach on the benefits of digital services such as the IKD and digital civil certificates are still lacking. Conversely, Scandinavian countries have succeeded in fostering active digital participation through community-based education and open data initiatives.

The challenges faced by Indonesia in implementing e-KTP and digital certificates highlight the need for a more adaptive policy approach that is grounded in local context and supported by cross-sectoral collaboration. This comparative geographic analysis underscores that the success of digital transformation is not solely determined by technological advancement, but also by structural, regulatory, and socio-cultural readiness. Thus, while digitalization holds great potential for improving public services, these challenges must be addressed through cross-sectoral approaches, inclusive strategic planning, and policies that are responsive to social and technological dynamics.

### **3.4. E-Governance and Community E-Readiness**

E-readiness defined as the capacity of both government agencies and citizens to adapt to digital systems is crucial for the successful implementation of digital services. Studies such as those by Mannayong [28] underline that in Makassar, the adoption of digital

services is closely tied to community e-readiness. The availability of digital infrastructure and the population's ability to access and utilize these services play a significant role in the overall effectiveness of public service delivery.

E-governance and community e-readiness are crucial aspects of the successful digital transformation of the public sector. The majority of articles assert that the effective implementation of e-governance relies heavily on three core pillars: technological access, digital literacy, and public engagement in service governance.

The recent studies reveal a multidimensional understanding of e-governance transformation through digital identity systems such as e-KTP and digital certificates, with notable variations across geographical and policy contexts. In both global and Indonesian settings, internet accessibility and digital literacy emerge as foundational prerequisites for successful digital public service implementation[15]. However, while countries in Eastern Europe have advanced in embedding community participation and digital deliberation utilizing tools like crowdsourcing and open data portals Indonesia continues to struggle with uneven digital literacy and limited grassroots involvement, particularly in remote regions.

The strategic development of e-governance infrastructure also demonstrates contrasting approaches. In countries like Serbia and Kazakhstan, national digital transformation is supported by strong regulatory alignment, portal integration, and EGDI-based performance metrics. Conversely, in Indonesia, although the integration of the IKD with SIAK reflects progress [4] institutional fragmentation and overlapping regulations continue to hinder system-wide interoperability and cross-agency data sharing.

Technological sophistication is another distinguishing factor. European and Central Asian contexts increasingly adopt advanced tools such as algorithms, cryptographic safeguards, and AI-powered platforms to reinforce transparency and accountability in public administration. In contrast, Indonesia's deployment of such technologies remains limited to pilot programs or urban centers, often constrained by budget, training gaps, and infrastructural inconsistencies.

Furthermore, while the normative aspiration of e-governance is rooted in democratization and citizen empowerment, it raises a critical caution: without adequate legal safeguards and participatory oversight, digital tools risk reinforcing opaque governance and enabling digital authoritarianism. This risk is particularly relevant for Indonesia, where data governance laws are still evolving and public awareness of data rights remains low.

In sum, the comparative analysis underscores that the impact of e-KTP and digital certificates on public service transformation in Indonesia is shaped not only by technological readiness but also by legal infrastructure, administrative coherence, and civic engagement. While global exemplars provide strategic benchmarks, Indonesia's success depends on its ability to localize reforms, prioritize inclusivity, and institutionalize transparent digital governance through sustained cross-sector collaboration.

### 3.5. Impact on ASN Performance

The integration of digital tools like e-KTP and digital certificates has a direct impact on the performance of civil servants (ASN) by reducing bureaucratic delays and minimizing human errors. Digital tools has facilitated better coordination between departments and reduced redundancies in service processes. These advancements are expected to lead to more efficient operations and improve public trust in the government's ability to deliver services. Digitalization has a significant impact on improving the performance of civil servants (ASN), particularly in terms of service efficiency, transparency, accountability, and adaptability to change. However, the success of this transformation heavily depends on training support, technological infrastructure, and bureaucratic reform.

Studies such as those indicate that digital competency training for civil servants plays a crucial role in enhancing work efficiency and preparing them for digital-based service systems. Institutional capacity development is also which highlight service acceleration and improved inter-agency coordination through digital systems.

Digitalization also drives a shift in performance measurement paradigms. Outcome-based performance is beginning to replace traditional administrative approaches, while [13] stress the importance of public participation and algorithmic tools to accelerate service delivery—though caution must be taken to mitigate bias. Several articles emphasize the enhancement of transparency and accountability among civil servants. [12] note that digital systems reduce opportunities for corruption and strengthen public financial management. The use of AI and cloud computing accelerates decision-making, enables real-time performance monitoring, and improves the accuracy of financial reporting.

Nevertheless, ethical and institutional challenges remain a concern. [10] warn that without bureaucratic ethical reform, digitalization may undermine the effectiveness of civil servants. Civil servants face increasing pressure to act transparently in the absence of well-developed digital ethics regulations.

Utilizing the Data Envelopment Analysis (DEA) model, highlights striking disparities in civil servant efficiency across countries, underscoring the importance of context-specific digital governance strategies. Countries like Denmark, Finland, and Estonia are cited as exemplars of efficiency, demonstrating the ability to optimize technological investments and human resources to produce consistently high-quality digital services. These nations have succeeded not only due to advanced infrastructure but also because of integrated digital policies, robust institutional frameworks, and a strong culture of accountability and innovation within their public sectors.

In contrast, Indonesia, while making significant progress through initiatives such as e-KTP and digital certificates, still faces systemic challenges in translating digitalization into measurable administrative efficiency. Although the adoption of these tools has led to some improvement in service delivery speed, transparency, and reduced bureaucratic layers, as seen in localized examples like Dukcapil Makassar, the broader national implementation is constrained by fragmented interagency coordination, uneven infrastructure development, and gaps in civil servant digital capacity.

Moreover, while digital tools have facilitated better performance monitoring and public accountability, they also impose new demands particularly the need for ethical governance frameworks, continuous technical training, and adaptive oversight mechanisms. Unlike Nordic countries where these elements are well institutionalized, Indonesia is still in the process of embedding such safeguards into its bureaucratic reform agenda. Therefore, comparative analysis reveals that while digitalization holds universal promise for enhancing public sector performance, its success is contingent upon the alignment of digital tools with coherent policy ecosystems, institutional readiness, and localized governance realities.

## 4. Conclusion

The systematic literature review and bibliometric mapping of 21 selected studies confirm that the digitalization of public services—especially through the implementation of e-KTP and digital certificates—has become a defining trend in the evolution of public administration from 2015 to 2025. This shift is not solely technological in nature; it marks a structural transformation in how governments operate and how citizens engage with state services.



Descriptively, the literature consistently emphasizes the widespread adoption of digital tools ranging from AI and cloud computing to mobile applications as enablers of efficiency and cross-sectoral integration. The most prominent impact identified is the enhancement of service efficiency and transparency. Digital systems have expedited workflows, minimized bureaucratic redundancy, reduced transaction costs, and enabled real-time monitoring, thus supporting a more accountable and responsive administration.

However, the analytical insight drawn from this review is that the success of such transformations is highly contingent on contextual variables—particularly the alignment of digital initiatives with institutional readiness, socio-political culture, and citizen digital literacy. The identified challenges—fragmented governance, infrastructure disparities, and ethical risks—are not peripheral, but central determinants of whether digitalization reinforces equity or exacerbates exclusion.

Therefore, the contribution of this study lies not only in mapping existing knowledge, but also in critically highlighting the overlooked interplay between digital governance design and public trust. Future strategies must integrate technological innovation with participatory governance, institutional reform, and capacity-building to ensure that digital identity systems such as e-KTP become tools of empowerment rather than instruments of technocratic control.

Regarding E-Governance and Community E-Readiness, digital literacy, citizen engagement, and data transparency have been identified as critical pillars of successful digital governance systems. Participatory and data-driven governance models have been shown to strengthen reciprocal relationships between governments and citizens and enhance policy transparency.

In terms of the Impact on ASN (Civil Servant) Performance, digitalization contributes positively to improving the speed, accuracy, and accountability of public officials. However, this effectiveness largely depends on digital competency training, technological readiness, and ethical reforms in the bureaucracy. Without adequate preparation or within unsupportive institutional environments, civil servants may face declining performance. The primary contribution of this study lies in its integration of bibliometric and thematic analysis approaches to better understand the direction, focus, and research gaps in the digitalization of public identity and service delivery. Mapping through VOSviewer identifies three major clusters of research focus:

1. Technology-based digital transformation,

2. Governance reform and public participation, and
3. Strengthening civil servant capacity and performance evaluation.

Recommendations arising from this review include:

1. Governments should design comprehensive cross-sectoral strategies that prioritize inclusivity, digital security, and ethical governance as core components in the implementation of digital services.
2. Continuous training for civil servants is critical to support service efficiency and integrity, especially in light of emerging ethical and technological challenges.
3. Future research should focus on underexplored areas such as the digital inclusion of vulnerable groups, digital participation in rural communities, and algorithmic risk evaluation in public service systems.
4. Digital system evaluations should extend beyond administrative outputs to also measure social outcomes, including public trust, equitable access, and citizen satisfaction.

With an adaptive, collaborative, and ethically grounded approach, digitalization can serve as a powerful force in strengthening public services that are responsive, transparent, and inclusive.

Key findings include:

#### 1. Widespread Adoption of Digital Public Services

Digital identity systems such as e-KTP and digital certificates have been broadly adopted across various national contexts, serving as key instruments in the modernization of public administration and the simplification of service delivery.

#### 2. Enhanced Efficiency and Transparency

Most studies report significant improvements in service speed, cost-efficiency, and accountability. Digital tracking, automation, and real-time data processing are among the mechanisms that have streamlined bureaucratic processes and reduced opportunities for corruption.

#### 3. Multidimensional Implementation Challenges

Digital transformation faces a range of barriers including infrastructure gaps, low digital literacy among both civil servants and the public, institutional resistance

to change, and unresolved issues related to privacy, data ethics, and system interoperability.

#### 4. Critical Role of E-Governance and Community Readiness

The success of digital services depends on citizen participation, access to technology, and transparent governance. Models of e-governance that embrace open data, participatory platforms, and two-way government-citizen communication are strongly associated with improved service outcomes.

#### 5. Improved Civil Servant (ASN) Performance

Digitalization has led to better task performance, more accurate service delivery, and enhanced monitoring of public officials. However, these improvements are conditional on proper training, ethical reform, and supportive institutional frameworks.

#### Three Dominant Research Clusters Identified via Bibliometric Mapping

VOSviewer analysis revealed:

1. Technological transformation and digital tools,
2. Governance and citizen engagement reforms,
3. Capacity-building and performance metrics for civil servants.

Emerging Research Gaps: There is a limited focus on digital inclusion of vulnerable populations, algorithmic transparency, and community-led oversight of digital services, signaling a need for future research in these areas.

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