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Dynamic Digital Transportation on Local Government: A Case Study on the Regional Government of the Special Region of Yogyakarta 2005-2025

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Abstract. Bureaucratic reform and digital Transportation have become central to improving public service quality in Indonesia, particularly within the Special Region of Yogyakarta (DIY). Despite significant progress, challenges remain in institutionalizing digital governance as a sustainable agenda. This study formulates the problem of how digital Transportation has unfolded in DIY between 2005 and 2025, and what factors have influenced its dynamics. The objective is to describe and analyze the long-term evolution of digital Transportation in local government, highlighting the interplay of technological, organizational, and policy dimensions. Methodologically, the research adopts a qualitative exploratory approach using a single-case design, relying on in-depth interviews, document analysis, and secondary data to capture the longitudinal process of change. The findings reveal that DIY's Transportation journey progressed from early e-government initiatives under the Jogja Cyber Province Blueprint to the Smart Province framework, supported by regulatory reforms, leadership continuity under asymmetric decentralization, and institutional coordination through Diskominfo DIY. Results indicate that while digital infrastructure, human resource development, and regulatory frameworks have advanced, sustainability remains constrained by hierarchical bureaucratic culture, limited funding mechanisms, and uneven digital literacy. The study contributes theoretically by framing digital Transportation as a co-evolutionary process shaped by socio-technical interactions, empirically by providing a detailed case study of DIY, and practically by offering policy insights for embedding digital governance into long-term institutional frameworks. The discussion emphasizes the need for stronger institutionalization, sustainable funding, and citizen-centered approaches to ensure resilience and inclusivity in future digital governance.

Keywords: Digital Government, E-Government, Digital Transportation, Local Government.

1 INTRODUCTION

1.1 Background of Study

Bureaucratic reform and digital Transportation of government are central to enhancing public service quality. Digital Transportation is the comprehensive integration of digital technologies—such as cloud computing, IoT, and big data—into government processes to create faster, more transparent, and more participatory services. Digitization involves converting analog data into digital formats, while digitalization and digital Transportation refer to utilizing these technologies to fundamentally change governmental operations and improve public policy and service delivery (Alos-Simo et al., 2021). Key drivers of digital Transportation in the public sector include political, economic, and technological factors, with an emphasis on adapting to technological innovations to improve government efficiency and reduce bureaucratic barriers.The evolution of this digital Transportation has led to concepts such as digital government, e-government, and smart government, which collectively encompass advanced uses of information and communication technologies in governance. Smart government represents a sophisticated stage of modernization, where disruptive technologies enhance interactions between citizens and government, decision-making, and overall quality of life (Arena, F., 2025). Essential components for developing smart government include robust digital infrastructure, AI, big data, and blockchain technologies to improve service efficiencies and decision-making quality.

Regulatory frameworks, governance policy formulation, effective human resource management, and data security risk management are critical to successful implementation. Public participation enhances transparency and accountability, and privacy measures protect citizens' personal data, fostering trust in digital services. Smart government architecture comprises five essential layers: the User Layer for citizen interaction; the Application Layer for service delivery; the Control Layer for regulatory compliance; the Database Layer for data management; and the Infrastructure Layer for foundational technology support (Becker, J. M., & Schmid, M., 2020).

Challenges to e-government implementation in developing countries include a lack of strategic planning, obsolete technology, rigid bureaucracy, insufficient skills, and the digital divide, all of which require focused policy support, planning, and infrastructure improvements. In Indonesia, the push for a "Digital Government" under the Electronic-Based Government System (SPBE) policy highlights ongoing initiatives to enhance public service effectiveness and transparency. The Special Region of Yogyakarta exemplifies progress in digital Transportation, consistently achieving high rankings under SPBE evaluations. As shown in Figure 1.

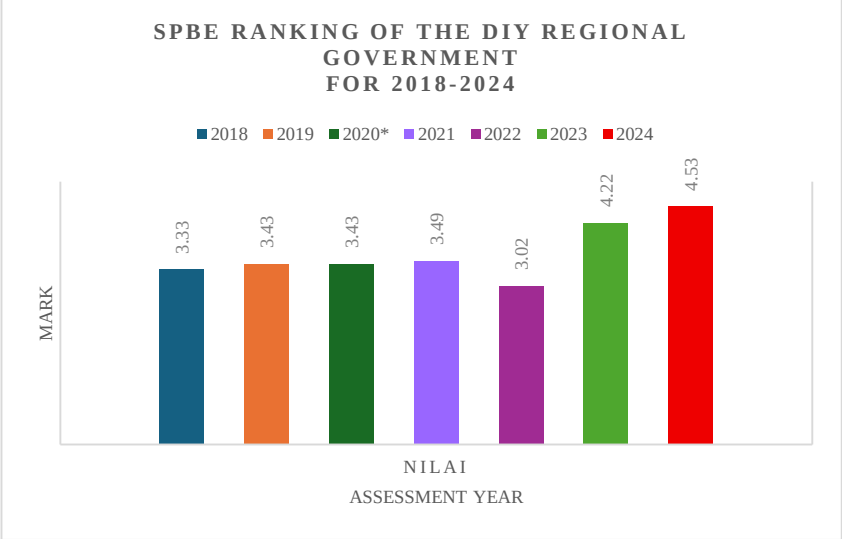

Figure 1. Ranking of the DIY Regional Government
Source: Ministry of Administrative and Bureaucratic Reform, 2025

The province of DIY (Yogyakarta Special Region) in Indonesia was the first to implement the e-Government concept through the Jogja Cyber Province Blueprint, established under Governor Regulation No. 42/2006. This regulation positions DIY as a "model province" focused on customer-oriented public service Transportation using information and communication technology (ICT) to enhance its competitive power. Support institutions such as the Innovation Group, Change Management, and JCT Training Center strengthen human resource capabilities and organizational culture across sectors, including policy-making, IT, human resources, and finance (Branderhorst, E.M., & Ruijer , E., 2024).

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The vision of e-Government has evolved into the Smart Province concept, outlined in the Jogja Smart Province Regional Action Plan (Governor Regulation No. 46/2019). This plan identifies a creative and innovative approach by local government and stakeholders to address strategic issues through technological optimization, data integration, and regional collaboration. The concept broadens the focus beyond public service to encompass Smart Society (high digital literacy), Smart Living, Smart Culture, Smart Environment, and Smart Governance, shifting from mere digital services to a comprehensive smart ecosystem (Dahlberg, T., & Tschang, F.T., 2021).

Governor Regulation No. 131/2021 further delineates the Grand Design of the region from 2022 to 2042, reinforcing long-term cultural preservation and innovation while emphasizing a digital ecosystem as a pillar of excellence. The 2024 Governor Regulation No. 32/2024 integrates and updates prior initiatives, revoking earlier regulations to reflect current developments. This comprehensive plan maintains stakeholder collaboration and technological innovation, incorporating additional dimensions like Smart Branding and Smart Economy.

Institutionally, the Communication and Information Service (Diskominfo DIY) serves as the main coordinator for smart province digital policies, overseeing the implementation of the 2024 plan. The previous regulations established inter-departmental teams for human resources development and emphasized community digital literacy, which continues to evolve in the current planning. Funding for these initiatives remains dependent on the DIY regional budget (APBD) and other legitimate sources, with no long-term commitment ensuring sustainability without routine budgeting (Gleeson, B., 2025).

Governor Regulation No. 46/2019 includes performance indicators and a roadmap for assessing sectors involved in the Smart Province initiative. The 2024 plan represents a systematic integration of these indicators into the regional planning documents (RPJMD) and national standards (SNI), establishing a framework for ongoing evaluation of the Smart Province initiative. Despite significant strides, digital Transportation in DIY has not yet been fully institutionalized into a cohesive, sustainable governmental agenda. It currently relies heavily on sectoral coordination led by Diskominfo and key actors without robust cross-regional authority. The unique political context, characterized by asymmetrical decentralization and historical privileges, imposes both challenges and opportunities for governance (Hartati, R., & Yuliana, M., 2023).

From a theoretical perspective, the unique asymmetric decentralization allows the region to maintain a stable political leadership structure, embodied by the Sultanate, which facilitates consistent long-term policy direction. However, challenges related to resource allocation and integration of IT infrastructure persist. Transportational leadership is highlighted in the context of public bureaucracy as a catalyst for enhancing effectiveness and commitment while fostering a collaborative culture that supports innovation. Yet, hierarchical cultures and resistance to change can obstruct progress, presenting ongoing challenges to digital competency within the public sector (Horlacher, A., & Hess, T., 2021).

1.2 Research Question and Research Objectives

The questionnaire study was arranged based on the opportunity selected for the above research. Question studies help researchers design directed and methodological research. Research objectives give direction and focus to research.

1.2.1 Question of Study

- How does digital Transportation in the government area study the case of the Yogyakarta Special Region Government 2005-2025?
- What factors influence the dynamics of digital Transportation in the government area studies case of the Yogyakarta Special Region Government, 2005-2025?

1.2.2 Research purposes

This study aims to describe the dynamics of digital Transportation in local government, a case study of the Yogyakarta Special Region Government in 2005-2025.

1.3 Benefits of Research

This is for enriching or modifying theory, practice, and digitalization from e-government to the digital government sector at the government level, local (provincial), and special levels, namely the Special Region of Yogyakarta Province. Implications of the research. This research can contribute to a theoretical basis for the modification theory of digital governance at the provincial government level.

1.4 Research Authenticity

This research contributes to the development of studies on the digital Transportation of local government by viewing it as a longitudinal organizational change process influenced by interactions among technological, organizational, and policy environment factors. Theoretically, this study views digital Transportation in government as a long-term evolutionary process. Methodologically, it uses a longitudinal approach to examine the implementation of digital policies over 2005–2025, thereby explaining the influence of regulatory changes, organizational restructuring, and leadership dynamics on the sustainability of digital Transportation at the regional level. Empirically, this study examines digital Transportation within the context of asymmetric decentralization in the Special Region of Yogyakarta (DIY), characterized by stable political leadership and specific institutional authority. Thus, this study contributes to explaining how regional institutional configurations influence the rhythm and direction of digital Transportation in government at the subnational level.

2. LITERATURE REVIEW

2.1. Digital Transportation in the Business Sector: Digital Transportation has become a significant concept in strategic management and information systems over the past two decades, particularly in response to technological disruptions and increased competition in the digital economy. It is viewed not merely as a technology adoption process but as a comprehensive organizational change that affects business models, structures, and value creation mechanisms. According to (Janssen, M., & Kuk, G., 2016), digital Transportation is defined as an ongoing process that induces significant changes within an organization by integrating various interconnected digital technologies. The literature has highlighted a lack of consensus regarding the definition of digital Transportation, with some using the analytical distinction between digitization, digitalization, and digital Transportation as proposed by (Ju, B., 2021). Digitization involves converting analog information to a digital form, while digitalization uses digital technologies to enhance existing processes. In contrast, digital Transportation embodies a significant strategic shift encompassing changes to organizational structure, business models, and customer interactions.

Recent studies emphasize that digital Transportation involves a multidimensional approach encompassing digital technology integration, organizational strategy, work culture, and leadership, thereby facilitating comprehensive changes across the organization. It acts as a mechanism for strategic renewal, allowing organizations to adapt to more data-driven service ecosystems (Kane, G.C. et al., 2019). This transition often utilizes advanced technologies, including blockchain, the Internet of Things (IoT), and artificial intelligence, to foster sustainable practices and improve resource efficiency. Organizational success in digital Transportation is largely contingent upon internal factors, such as digital culture, leadership, and employee engagement. Transportational and adaptive leadership is pivotal in mitigating resistance to change and promoting innovative practices (Leonardi, P. M., 2022). Furthermore, the development of organizational learning and knowledge management capabilities is crucial for achieving higher digital maturity and navigating the complexities of the digital environment.

2.2 Digital Transportation in the Public Sector

2.2.1 Digital Transportation as the Shift from Digitalization to Transportational Institutional : The literature on digitalization in the public sector has evolved from e-government discourse, which emphasizes the use of information and communication technology (ICT) for service delivery. Initially, technology was viewed primarily as a tool for administration, aimed at enhancing operational efficiency and service quality (Lin, Q., 2024). However, digital Transportation within public organizations extends beyond mere administrative procedures; it encapsulates a fundamental change through the integration of digital technology in governance decision-making processes (Liu, L., Wei, X., & Chen, W., 2022). This Transportation reflects a shift from using technology solely as an administrative tool to addressing socio-technical factors that influence organizational structure and data-driven decision-making practices.

2.2.2 Shift Paradigm: From Technology-Centric to Socio-Technical Governance: Digital Transportation in government is increasingly understood as a socio-technical phenomenon involving interactions among digital infrastructure, organizational capacity, leadership, bureaucracy, and external regulatory pressure (Luo, J., 2022). Perspective: This mark shift is important in the technology-centric approach, recognizing that the implementation of digital technology in the public sector is ongoing in complex organizations and is governed by relatively rigid institutional norms and stable. A number of studies show that the adoption of digital technologies such as artificial intelligence (AI), big data analytics, cloud computing, Internet of Things (IoT), and blockchain does not automatically produce improved performance for government if not accompanied by changes in organizational culture and governance mechanisms policy (Mutiasari, ED, & Fadhilah,

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R., 2025). In this context, digital Transportation is not only about modernizing infrastructure technology, but also about organizations' ability to publicize and integrate data into practice to inform policy decisions.

2.2.3 Theoretical Debate: Technological Determinism versus Institutional Capabilities: In practice, the implementation of digital Transportation in government organizations is often influenced by regulatory dynamics, leadership rotation, bureaucratic structural reconfiguration, and cross-sectoral system integration that occurs gradually and not always linearly (Nugrahadi, Z. (2021). This indicates that digital government Transportation cannot be adequately understood through an analytical framework that statically separates technological factors from organizational capacity. Digital Transportation in the public sector is better understood as a process of institutional adaptation that evolves through the configuration of interactions among digital technology, organizational capacity, and external policy pressures. static and oriented towards factors influencing innovation adoption at a single point in time (Nurrohman, B., & Ramadhan, G., 2024). Not yet, in a way that is explicit, capable of explaining the dynamics of change in ongoing organizations longitudinally in the digital government Transportation process.

2.3 Electronic Government (e-Government): The beginning of e-government development is marked by the prevalence of the New Public Management (NPM) paradigm, managerial reform, and a positive view of technology in public administration. During this period, e-government is understood as the implementation of information and communication technology (ICT) to increase efficiency, effectiveness, transparency, procedural fairness, and the quality of public service. Research has begun to emphasize the digitalization of administrative processes, the development of government websites, the management of information systems, and service-based automation such as licensing, taxation, and population administration (OECD, 2020).

The literature presents classic e-government technology as an instrument of rational repair for the lack of bureaucratic tradition, which is characterized as slow, hierarchical, and unresponsive. Framework-neutral work to nature and universal basis technology, allowing its implementation across various government contexts. Research: This study identifies striking similarities across various e-government maturity models that put forward linear and gradual development, starting with web presence, followed by interaction, transaction, integration, and culminating in Transportation (Peng, B., 2022). These models are widely adopted in research and policy because they provide a straightforward and measurable framework.

Research in this field highlights technical elements such as bandwidth, security system, and the usefulness of the website as important factors for success. The institutional and governance-oriented camp denies this assumption, arguing that structure, organization, leadership, regulation, and culture and bureaucracy are far more influential than technology itself. Methodological criticisms also emerged as a theme central to the beginning of e-government literature. Many studies use a quantitative descriptive approach, including surveys of e-government readiness, government website indexes, and cross-country or regional benchmarking (Prasetyo, H., & Astuti, TD, 2020). These methods, although beneficial for mapping early, have faced criticism because their analysis is inadequate for the process, stakeholders' interests, and the dynamics involved in policy implementation. Early e-government literature is more proficient at discussing the extent of technology adoption, but not deep enough in explaining the reasons and mechanisms behind the success or failure of digital policy.

2.4 **Group Instrumental and Managerial Approaches:** They, in a way, generally agreed that e-government is the use of ICT to increase efficiency, effectiveness, transparency, and quality of public service. This is reinforced by the (Purnama, D., & Nugraha , E., 2024), which explicitly states that e-government can transform the relationships between government and citizens and between government and the business world through digital technology. Pro-e-government literature starts from the assumption that technology is neutral and progressive, so that ICT adoption is believed to produce more government Good in an automatic way.

2.5 **Group Approach Institutional and Political:** On the other hand, the group's second question claims normative e-government as a universal solution. (Sarioguz , O., & Miser, E., 2024) is one of the academics who began to criticize the instrumental approach, stating that e-government is often perceived as a technology project, not a governance reform. He confirms that technology is only effective when accompanied by changes in organizational structure and cultural bureaucracy. Further criticism was offered by (Schmitt, M., 2024), who argued that e-government has the potential to strengthen state control rather than expand democratic participation. According to him, e-government can increase internal efficiency, but not in a way that automatically produces openness or accountability to the public.

2.6 **Evolutionary Critique: From E-Government to Digital Government:** Criticism of the definition of classic e-government has led to the emergence of an evolutionary approach. (Soto-Acosta, P., 2022) argue that e-government is too narrow because it focuses on digital services rather than on engineering repeatable government functions. They introduce the concept of Digital-Era Governance as a response to the failure of early e-government approaches. This was expanded by (Sulastri, S., & Permatasari, A., 2023), who systematically criticized the next generation of e-government as digitization-centric. According to Janowski, e-government is at the stage of beginning to understand the dynamics of the political and social spheres, so it needs to transform into a contextual digital government and digital governance. It criticized the domination indicator efficiency in the definition of e-government. They emphasize that the success of e-government should be measured by public value, including trust in public institutions, participation, and access to justice.

2.7 Influencing Factors: The Success of E-Government:Success factors in partial implementation of e-government include the availability of ICT infrastructure, the capacity of human resources, and support budget (Wahyudi, A., & Dewi, AR. 2024). The literature shows that related factors alone are insufficient. Research conducted by shows that leadership, political and administrative clarity, regulation, governance information, and coordination across organizations are the main determinants of e-government success. From a coevolutionary perspective, success occurs when innovative technology coincides with adaptive organization and simultaneous changes in institutions.

2.8 E-Government in DKI Jakarta: In the Indonesian context, DKI Jakarta is often positioned as a leading regional digital government through the development of Jakarta Smart City, data integration across OPDs, and the use of digital dashboards to handle crises, especially during the Covid-19 pandemic. Studies show that digital innovation in DKI Jakarta increases the responsiveness of public services and the coordination of policy data-based (Yuliana, S., & Astari , D., 2025). However, the study clearly confirms that DKI Jakarta's success cannot be separated from its status as an area with special fiscal capacity and strong political leadership. Data integration across OPDs still faces resistance from organizational and sectoral egos and dependence on tall-figure leaders . The literature also highlights the sustainability of risk post-transition digital policy leadership, as it is not yet fully institutionalized in regulations and bureaucratic routines.

3 RESEARCH METHOD

3.1 Research Approach: This qualitative exploratory study adopts a holistic, single-case design to examine phenomena related to policy and governance in digital government. The approach seeks to provide an in-depth understanding of these dynamics through comprehensive analysis rather than merely descriptive observation. The research begins with empirical facts gathered directly from the field, where researchers actively engage in the context, observing phenomena, systematically recording data, interpreting findings, and reporting conclusions. Consequently, the study's findings offer potential contributions to theoretical propositions and can inform concepts and principles based on empirical realities. Data was collected through in-depth interviews, document analysis, and meticulous research documentation. The analysis involved enriching information, exploring relationships, comparing data sources, and identifying emerging patterns. The results are presented as an analytical narrative that elucidates the conditions and dynamics of the studied phenomenon while addressing the "how" and "why" of digital policy and governance issues.

3.2 Case Selection: This study examines the digital Transportation journey of the government in the Special Region of Yogyakarta (DIY) over the last 25 years. It traces the evolution from initial information technology implementation in public administration to the development of e-government and the shift towards digital governance. The choice of DIY as a case study is due to its unique governance structure, which includes distinctive decision-making processes and institutional arrangements influenced by asymmetric decentralization as per Law No. 13 of 2012. The Transportation in DIY is characterized by an evolutionary rather than instantaneous process, supported by information technology since the late 1990s. It has progressed through the establishment of an e-government system that integrates services across organizations and utilizes data for decision-making, particularly highlighted during the post-COVID-19 period.

This research takes a holistic approach to digital Transportation, addressing various dimensions such as technology, policy, leadership, organizational capacity, institutional configuration, data governance, and interactions between governmental and non-governmental actors. It aligns with co-evolutionary frameworks, indicating that digital governance arises from dynamic interactions among diverse elements within specific social and political contexts. The research not only describes the developmental stages of government digitalization but also seeks to understand the motivations behind this Transportation in a privileged region. The findings aim to contribute theoretically to the study of digital government by elucidating the dynamics of digital Transportation in asymmetrically decentralized regions and enhancing the discourse on digital governance in Indonesia, making it more contextual.

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3.3 Unit of Analysis

This is the digital Transportation process of government in the Special Region of Yogyakarta (DIY), which includes the evolutionary application of technology and information, e-government development, and the embodiment of digital government in the context of privileged areas. The unit of analysis is understood as a holistic unity, analyzed longitudinally through the dynamic interaction among policy, leadership, institutions, organizational capacity, data governance, and the use of digital technology within the government organization. Thus, research. No separate units of analysis within organizational sub-units are certain; rather, the focus is on the dynamics of digital Transportation of the DIY government as a case study**.**

3.4 Grid Study:In case study research, a research framework is required as an analytical tool to ensure the research process is systematic, directed, and remains focused on the research objectives. This framework serves as a guide for directing data collection and analysis to ensure it remains within the defined case boundaries. Furthermore, this observation framework will be tested and deepened through in-depth interviews. Details of this research's observation framework are presented in Table 1.

Table 1. Research Grid

Grid Study	Information	Method of collecting data
Co- evolution identification e-government Transportation towards digital government	In the initial phase, the use of technology information in the government sector focused on improving service efficiency and accessing information, with changes in organizations and institutions still limited and influenced by a relatively stable bureaucratic culture. The transition phase, interaction technology, and organization are more intensive through integration services and coordination across device areas, while the institutionalization of digital Transportation is heavily influenced by leadership and culture. In the advanced phase, interaction technology, organizations, and institutions are more integrated and consolidated, so that digital Transportation is oriented towards the creation of a public mark, community participation, and the sustainability of governance. HR, Budget, related regulations, working methods between units Influential factors	• Interview • Secondary Data
Identify influencing factors	• Regulation • Policy applicable national • Leadership factors • Regional development planning • Division of government affairs • Collaboration and partnership	• Interview • Secondary Data

Source: Analysis Author, 2026

3.5 Data Collection Method: In the study of digital Transportation within the government of Yogyakarta Special Region, both primary and secondary data are utilized to provide a comprehensive understanding. Primary data, which serves as the main source, is gathered through direct interactions between researchers and the subjects involved in the Transportation process. This qualitative information encompasses the experiences, perceptions, knowledge, and practices of key actors in digital Transportation. Notable primary data includes in-depth interviews, coordination patterns, and dynamic behaviors encountered during the study. Conversely, secondary data, which supports the primary findings, is derived from various written and documented sources. This includes policy documents, legislative regulations, strategic plans, performance reports, institutional archives, and official publications pertinent to the government's digitalization efforts. Moreover, secondary data comprises academic literature, research reports, and relevant scientific publications, which enhance the analysis and provide a theoretical context to the empirical findings.

3.5.1 Primary Data Collection: In this research on the digital Transportation of the Yogyakarta Special Region government, primary data was primarily collected through in-depth interviews and documentation. The in-depth interviews involved key informants directly engaged in policy formulation, planning, and execution of digital Transportation initiatives. These semi-structured interviews allowed for a comprehensive exploration of various factors influencing digitalization, including leadership roles, institutional dynamics, and cultural governance aspects. Key informants included members of the DIY Communication and Information Service, the Regional Development Planning Agency, and other relevant stakeholders. The informants were selected using snowball sampling, focusing on in-depth knowledge and relevance to the research topic, allowing for continuous referral until information saturation was achieved.

Documentation supported the research by collecting both primary and secondary data. Primary documentation involved recording interviews with informants, capturing photos of research activities, and noting the infrastructure and digital systems relevant to the government's digital initiatives. This provided empirical evidence of the observed digital Transportation practices. On the other hand, secondary documentation included gathering information from various written sources such as government policies, regulations, and official reports, which helped to contextualize and strengthen the analysis of the primary data. The combination of these methods ensured a robust approach to understanding the dynamics of digital Transportation in the Yogyakarta Special Region government.

3.5.2 Secondary Data Collection: The study utilizes secondary data, which includes official documents, performance reports, and policy archives from the Yogyakarta Special Region Government (DIY) to provide context and support the analysis of primary data related to the digital Transportation of government. The collected secondary data encompasses several types:

Development planning documents like the Long Term Regional Development Plan (RPJPD) and Medium Term Regional Development Plan (RPJMD) guide area policy development and the role of information technology, e-government, and digital governance in sustainable planning. Information Accountability Reports (LKPJ) from the Governor covering 2006-2026, identifying policy dynamics, priority programs, and achievements concerning technology information utilization and public service digitalization across government periods. Government Performance Accountability Reports (LAKIP) from strategic agencies involved in digital governance, aiding the analysis of performance indicators, programs, and related activities within the information governance system, and integration of digital services. Technical planning documents related to the digital government sector, including the Yogyakarta Special Region e-Government Masterplan and infrastructure development plans prepared by local authorities. Supporting policy documents for government digitalization, focusing on regional data center management, public service application integration, interoperability standards, and data governance regulations. Legal regulations and local government products, detailing regional laws, governor regulations, and statutes for regional organization and governance implementation of e-government and digitalization. Operational activity data, like program implementation reports from the DIY Communication and Information Service, system implementation documentation, and cross-agency coordination reports. The use of these secondary data sources provides a comprehensive understanding of the ongoing digitalization efforts in the Yogyakarta Special Region, facilitating triangulation with primary data gathered through interviews to enhance the study's validity. As shown in Figure 2.

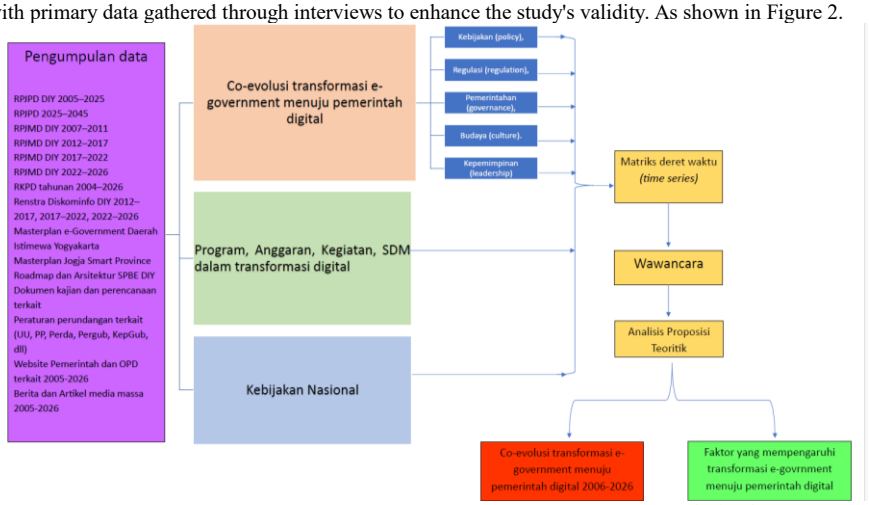

Figure 2. Analysis Flow

3.6 Data Analysis

Data analysis in case studies is crucial for quality inference and theoretical contributions. Yin (2018) identifies it as a systematic process linking empirical evidence with research propositions. In longitudinal studies, it tracks temporal changes, recurring patterns, and explanatory mechanisms, emphasizing digital

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Transportation processes over time. The study focuses on the Yogyakarta Special Region Government, analyzing its digital evolution through four strategies: pattern matching, explanation building, logic models, and time-series analysis. The analysis follows structured stages: organizing secondary data, exploring technological and organizational interactions, constructing time-series matrices, identifying influencing factors, and preparing narratives. This approach highlights the dynamics of digital Transportation and informs policy recommendations, shaping understanding of government digitalization at the subnational level.

3.7 Framework of Study: In conducting research, a systematic flow is required so that the research process is directed, focused, and structured. This flow poured in framework research presented in Figure 3.

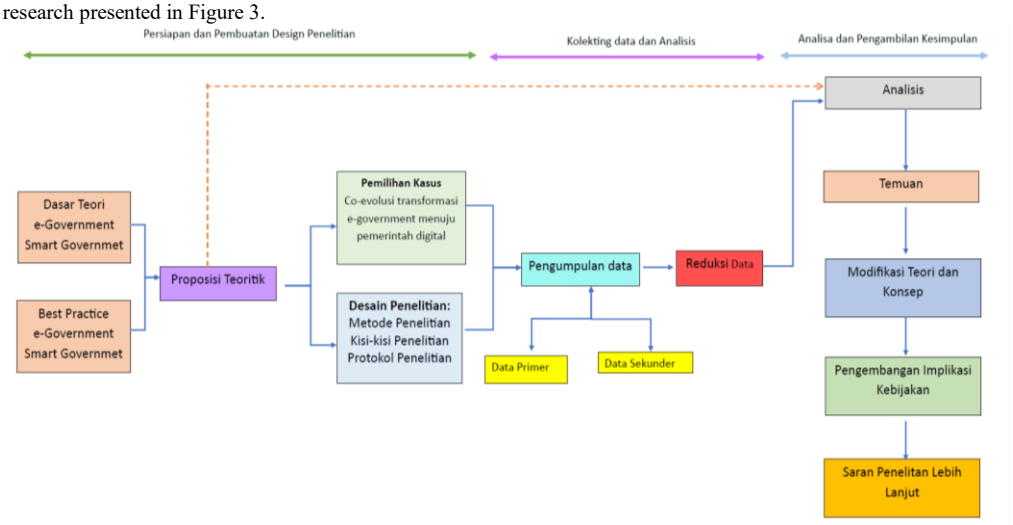


Figure 3. Research Framework : *Source: Visualization Writer based on Yin (2018)*

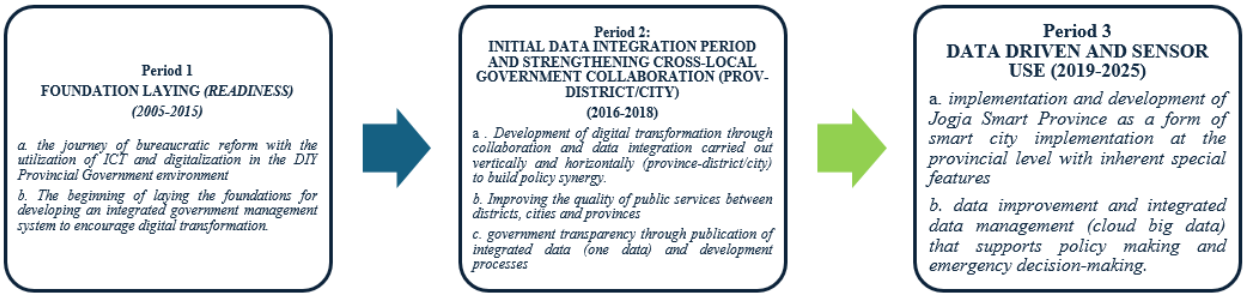
4 RESULTS AND DISCUSSIONS

4.1 Analysis Each Period in the Digital Transportation of the Regional Government of the Special Region of Yogyakarta 2005-2025

The Special Region of Yogyakarta initially implemented ICT use to improve bureaucratic performance. From this, it then undertook a digital Transportation to realize effective, efficient, transparent, and accountable governance in providing excellent and quality public services to the community. The Regional Government of the Special Region of Yogyakarta (Pemda DIY) implemented the digital Transportation in stages, adapting to ongoing dynamics both at the regional level and to national policies. The two-decade journey to realizing digital Transportation in good governance has seen changes categorized into three periods. Outline periodization of digital Transportation in the DIY Regional Government can be seen in Figure 4 below:

Figure 4. Period Digital Transportation in Local Government, Special Region of Yogyakarta 2005-2025 - Source: author's analysis results, 2026

4.1.1 PERIOD 1: FOUNDATION LAYING (READINESS) 2005-2015



4.1.1.1 National Policy Context and the Early Development of Information and Communication Technology (ICT) in DIY

The development of smart government in Indonesia began with early e-government efforts in the 1990s, transitioning from typewriters to computer-based systems. In 1992, policies were introduced to establish Electronic Data Processing Offices at the regional levels, influencing local regulations, particularly in Yogyakarta. A significant advancement occurred in 2000 with the formation of the Indonesian Telematics Coordination Team, which aimed to enhance telematics technology and bridge the digital divide. The launch of the Government Online (G-Online) initiative in 2001 marked a strategic move towards integrating technology into governance, promoting transparency and efficiency. In 2003, a national policy consolidated these efforts, emphasizing user-centered electronic public services and requiring coordinated strategic framework development across levels of government. Regional regulations in the following years, especially in Yogyakarta, realigned governmental functions, leading to the establishment of integrated telecommunication departments, reflecting a shift towards effective digital governance. However, this evolution faced challenges in data integration and consistent policy alignment, underscoring the need for strong digital leadership for future advancements towards a comprehensive smart government.

4.1.1.2 Technology

The national policy on the implementation of Information and Communication Technology (ICT) in government organizations, formalized by Presidential Instruction Number 3 of 2003, emphasizes ICT as a strategic tool for enhancing management systems and government processes. This initiative aims to create a more effective, efficient, transparent, and accountable e-government structure. The Special Region of Yogyakarta (DIY) has embraced this policy through Regulation Governor Number 42 of 2006, establishing the Blueprint for Jogja Cyber Province, focusing on Digital Government Services (DGS) to improve public service quality by integrating ICT. Since 2002, DIY has developed technological infrastructure, including LAN and WAN networks, facilitating inter-unit communication within government organizations. The Jogja Cyber Province Blueprint includes nine flagship DGS programs tailored to various sectors, such as agriculture, health, education, and tourism, demonstrating a sectoral approach to digital services.

Additionally, support programs have been created to enhance internal government services and public utilities, expanding the e-government ecosystem. From 2015 to 2016, the DGS expanded to cover multiple fields, underscoring the commitment to utilize ICT strategically in governance. This digitalization extends beyond traditional sectors, influencing welfare, environmental, and cultural issues. Consequently, the DGS concept promotes Transportation towards a citizen-centric governance model, enhancing public access to information and services, fostering greater participation in governance, and ultimately improving the welfare and competitiveness of the Yogyakarta population.

4.1.1.3 Organization

The digital Transportation of the Yogyakarta Province (DIY) from 2005 to 2015 reflects ongoing bureaucratic reform post-1998, which predominantly focused on transparency, accountability, and administrative efficiency without significant structural changes. The introduction of Information and Communication Technology (ICT) was aimed at modernization rather than a complete Transportation of governance. The Jogja Cyber Province (JCP) initiative showcased compliance-based digitalization rather than a strategic overhaul, leading to siloed sectoral systems rather than integrated services. The 2006 earthquake prompted

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the launch of Digital Government Services (DGS) as a crisis response, aimed at improving data collection and coordination, but it failed to resolve systemic bureaucratic fragmentation. While DGS expanded across various public sectors, it reinforced existing organizational silos and did not foster integrated data management. Limitations in leadership, human resources, infrastructure, and organizational culture hindered the effectiveness of DGS during this period, indicating a gap between policy design and practical implementation. The Transportation was more reactive than proactive, revealing a critical need for improved digital governance and integration for future progress.

4.1.1.4 Institution

The period from 2005 to 2015 marked the initial phase of establishing digital government institutions in Yogyakarta Province, Indonesia, amidst post-1998 bureaucratic reforms. During this time, digitalization was not seen as a comprehensive governance Transportation but as a modernization effort aimed at enhancing efficiency, transparency, and procedural order. The agenda for enhancing information and communication technology (ICT) within the provincial government gained legitimacy through national policies, particularly the Presidential Instruction No. 3 of 2003, which encouraged electronic government systems. Empirical findings indicate that the provincial government of DIY successfully built a foundational digital institution through internal regulations, core application systems, and ICT infrastructure, exemplified by over 2,700 connected computers and significant bandwidth. However, considerable limitations were identified. The digitalization process remained fragmented and sectoral, with each regional government agency (OPD) developing its own standards, leading to poor data integration. Additionally, a notable shortage of technically skilled human resources constrained the effective management and development of digital systems. Moreover, the culture of data management and public information transparency did not consistently develop, indicating that despite the presence of digital systems, practices were not standardized. This period established a formal framework and technical capacity for further digitalization, yet it highlighted issues such as system fragmentation, inadequate data integration, and insufficient internalization of digital governance values. These challenges signal the need for regulatory adjustments, organizational restructuring, and stronger digital leadership for future Transportation.

4.1.1.5 Factors that Influence in This Period

Government digital Transportation in the Special Region of Yogyakarta Province (DIY) from 2005 to 2015 was influenced by various structural, institutional, and contextual factors, leading to partial and sectoral achievements. Key influencing factors include:

- Policy Factors: The national e-government policy emphasizes compliance over substantive governance, leading to a lack of internalization of the Digital Government Services (DGS) blueprint among local agencies, which operate separately rather than cohesively.
- Organizational Factors: Bureaucratic structure remains hierarchical and fragmented, preventing effective cross-organizational coordination and integration, resulting in disconnected information systems across sectors.
- Crisis Factors: The 2006 earthquake highlighted the limitations of conventional bureaucracy in managing disaster response, necessitating an integrated information system, but lessons learned were not institutionalized post-crisis.
- Technology Factors: While significant advancements in ICT infrastructure were made, the focus on sectoral applications led to poor data integration capabilities across agencies.
- Human Resource Factors: Dependence on individual technical capacities limits the sustainability of DGS, as not all agencies possess the necessary skilled personnel for independent technical management.
- Cultural Factors: Organizational culture does not treat data and information as strategic assets but rather as administrative burdens, hindering documentation and transparency practices.
- Infrastructure and Planning Factors: Incremental and uncoordinated infrastructure development restricts DGS effectiveness, resulting in unequal digital service availability across agencies.
- Regulatory and Organizational Change Factors: Changes in regulations governing organizational structures disrupt DGS governance and continuity, diminishing its role as a cross-sector governance tool and slowing down data integration efforts.

Overall, these factors demonstrate a complex interplay that has hindered a cohesive digital Transportation in the region.

4.2 Period 2: INITIAL DATA INTEGRATION PERIOD AND STRENGTHENING CROSS-LOCAL GOVERNMENT COLLABORATION (PROV-DISTRICT/CITY) 2016-2018

4.2.1 National Policy Context and Information Technology (ICT) Development

The Transportation of digital government and smart cities in Indonesia is grounded in a multi-layered national policy framework, specifically articulated in Law Number 23 of 2014 and Government Regulation No. 18 of 2016, which empower regional governments to innovate in governance and public services. The central government's 2017 initiative, Movement Towards 100 Smart Cities, signals a shift to an integrated approach for urban development. This includes the establishment of Presidential Regulation No. 95 of 2018 on the Electronic-Based Government System (SPBE), which aims to standardize digital governance. In the Special Region of Yogyakarta (DIY), which has unique constitutional privileges, the digitalization agenda is integrated into regional development planning (RPJMD 2017–2022), emphasizing human-centered development through improved public services. The leadership in DIY plays a crucial role in adapting national policies to its specific context, informed by a philosophy that encourages moral legitimacy and strategic governance changes.

4.2.2 Technology

The period from 2016 to 2018 in the Special Region of Yogyakarta marks a phase of technological consolidation in the realm of digital government. This stage is characterized by foundational efforts to integrate data and enhance connectivity among Regional Apparatus Organizations (OPD), alongside fostering collaborative opportunities between provincial and district/city governments. The information and communication technology (ICT) infrastructure, particularly the Fiber Optic network and increased internet bandwidth, signified substantial progress. Nevertheless, while the technical connectivity improved, substantive integration and standardization of data remained inadequate. The Blueprint Jogja Cyber Province, aimed at developing e-government, served as the normative framework, prompting sectoral applications in various strategic OPDs. However, evaluations indicated that the blueprint had not been fully operationalized, leading to fragmented practices and application silos. This situation hampered broader cross-sector and cross-regional collaborations.

Efforts toward data integration became clearer with the establishment of the Integrated Development Management Center (IDMC) and a regional data warehouse. While the IDMC aimed to provide real-time operational oversight, it was mostly limited to provincial control without effective collaboration with district/city governments. The Jogja Smart Province (JSP) initiative sought to extend beyond basic e-government services towards smart governance. Yet, it faced challenges regarding robust data governance, such as a lack of agreements and clearly defined responsibilities. Public service applications like Jogja Istimewa and e-Lapor DIY enhanced transparency and interaction quality between the government and citizens. However, these remained largely informational rather than integral to cross-regional decision-making.

Throughout these years, the Yogyakarta Regional Government focused on building the ICT foundation necessary for future data integration. In 2016, a significant push was noticed in the establishment of a digital government infrastructure, focusing on internal efficiency. The subsequent year saw a conceptual shift with the introduction of data-driven decision-making tools like the IDMC, yet collaboration was still predominantly vertical and province-centric. By 2018, the IDMC had evolved into a public portal, facilitating broader data integration and supporting public services. Although advancements were made in promoting transparency and openness, the actual effectiveness of collaborative decision-making systems remained limited, emphasizing the necessity for better human resource readiness and enhanced data analytics capabilities among OPDs and local governments.

4.2.3 Organization

In the Yogyakarta Special Region Government, the integration of poverty data has evolved from a technical endeavor to a politically mediated collective agenda, essential for addressing sensitive inter-organizational needs. Initially, distinct definitions of poverty data across various regional government agencies (OPD) created challenges in consistency and alignment, leading to resistance rooted in autonomy concerns. This resistance reflects underlying power dynamics within decentralized bureaucratic organizations rather than mere technical failures. The symbolic leadership of Sri Sultan Hamengku Buwono X played a crucial role in overcoming these tensions by framing data integration as a moral duty aligned with the common good, rather than an administrative obligation.

The process revealed that success hinged on navigating the negotiations among various stakeholders, including the recognition of poverty data as not just a statistic, but a source of power and legitimacy in policymaking. Informal communication and collaborative discussions facilitated by technocratic actors proved essential in fostering cooperation. As trust and shared understanding developed through initial successes, perceptions of data integration shifted; it began to be seen as a necessary strategy for enhancing policy targeting and minimizing inter-agency conflict. This evolution into a more unified approach toward poverty data illustrates the complexity of governance in fragmented systems and highlights the importance of legitimate authority and trust in collaborative efforts.

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4.3 Key Insights

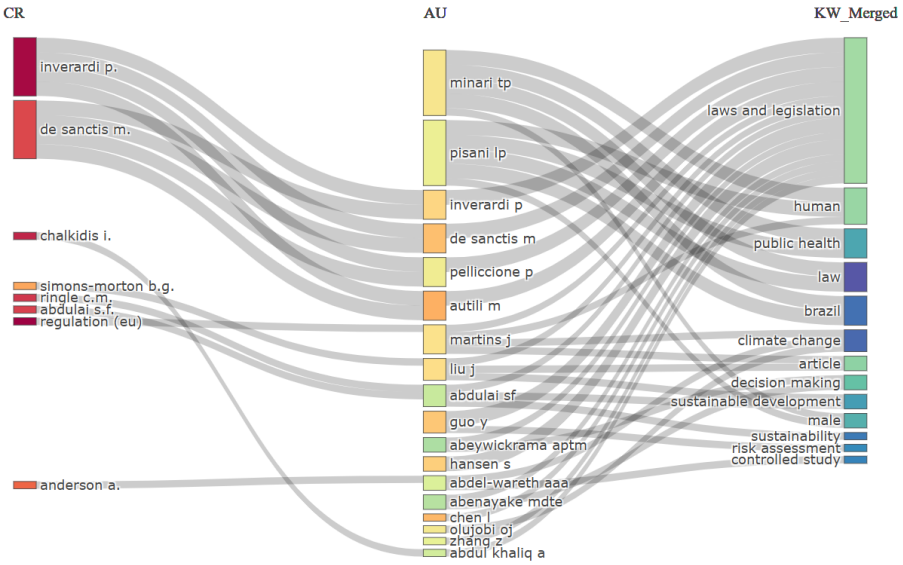

Figure 5. Three Fields Plot

This figure 5. presents a three-field Sankey diagram linking cited references (CR), authors (AU), and merged keywords (KW_Merged), revealing the intellectual and thematic structure of the research domain. A dominant insight is the central influence of key scholars, particularly Minari TP, Pisani LP, Inverardi P., and De Sanctis M., who act as major intellectual bridges between foundational references and thematic outputs. The thickness of flows indicates that these authors significantly consolidate prior knowledge into current research streams. Notably, Inverardi and De Sanctis appear both as cited references and active authors, suggesting high continuity and self-reinforcing scholarship within the field. From a thematic perspective, the most prominent keyword is "laws and legislation," indicating that the field is strongly anchored in regulatory and legal analysis. This is complemented by secondary but interconnected themes such as "human," "public health," "law," and "climate change," pointing to an interdisciplinary convergence between legal frameworks and societal challenges. Emerging topics like "decision making," "sustainability," and "risk assessment" suggest a shift toward applied and policy-relevant research. Additionally, smaller nodes (e.g., Abdulai SF, Guo Y) connect to niche keywords, reflecting fragmented but growing sub-discourses. Overall, the diagram highlights a core-periphery structure, where a few influential authors and legal-centric themes dominate, while sustainability and health-related issues are expanding the field's scope.

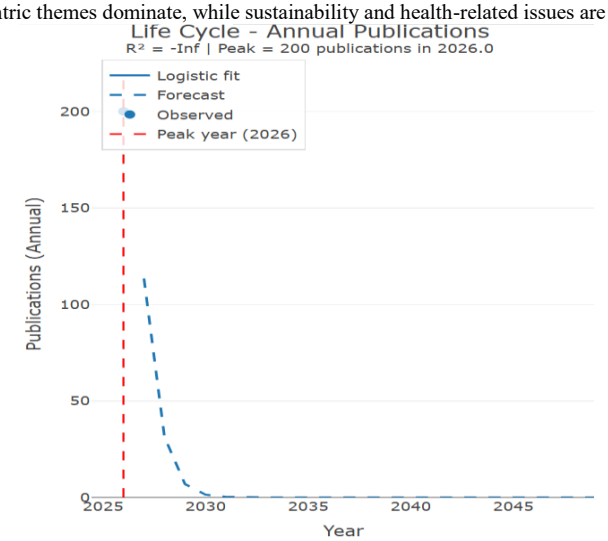

Figure 6. Life Cycle Publication

Figure 6 illustrates a life-cycle analysis of annual publications using a logistic growth model, providing insight into the maturity and future trajectory of the research field. The reported $R^2 = -\infty$ indicates a poor or invalid model fit, suggesting that the logistic function does not appropriately capture the empirical publication trend. This may result from insufficient or highly irregular observed data, making the predictive validity of the model questionable. The model identifies 2026 as the peak year, with approximately 200 publications, marked by the red dashed vertical line. However, the subsequent forecast (blue dashed line) shows an abrupt and unrealistic decline to near-zero publications shortly after 2027. In a typical scientific domain, publication output rarely collapses this sharply, indicating model misspecification or overfitting. The observed data points (blue dots) appear sparse and limited in temporal coverage, which likely undermines the robustness of the logistic estimation. Additionally, the absence of a gradual saturation phase—expected in standard innovation diffusion or bibliometric life cycles—further weakens the interpretation. Substantively, this figure suggests that the field may either be prematurely modeled as mature or lacks sufficient longitudinal data for reliable forecasting. A more appropriate approach would involve alternative models (e.g., exponential smoothing, ARIMA, or piecewise regression) and extended datasets to better capture growth dynamics.

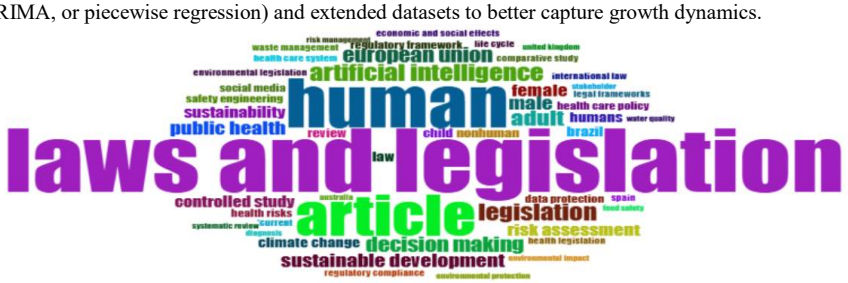

Figure 7. World Cloud

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Figure 7, a keyword co-occurrence word cloud, visualizes the thematic salience and conceptual structure of the research field, with term size indicating frequency and prominence. The overwhelming dominance of "laws and legislation" signals that the field is fundamentally regulation-centric, emphasizing legal frameworks as the primary analytical lens. This is reinforced by closely related terms such as "legislation," "law," and "regulatory framework," suggesting a strong doctrinal and policy-oriented research orientation. The second-tier prominent term, "human," highlights a human-centered perspective, indicating that legal discussions are often contextualized around human impacts—particularly in domains such as "public health," "adult," "male," and "female." This aligns with the visible clustering around health governance and bioethical considerations. Notably, "artificial intelligence" emerges as a significant theme, reflecting a growing intersection between technology governance and legal systems. This indicates an evolving research frontier focused on AI regulation, data protection, and ethical compliance. Additional clusters such as "sustainable development," "climate change," "risk assessment," and "decision making" point to the integration of environmental governance and policy analytics, suggesting a shift toward multidisciplinary and impact-driven research. Meanwhile, methodological terms like "article," "review," and "controlled study" indicate a mix of empirical and review-based scholarship. Overall, the visualization reveals a legally anchored, interdisciplinary field, increasingly expanding toward technology regulation and sustainability governance, with strong emphasis on human-centered policy implications.

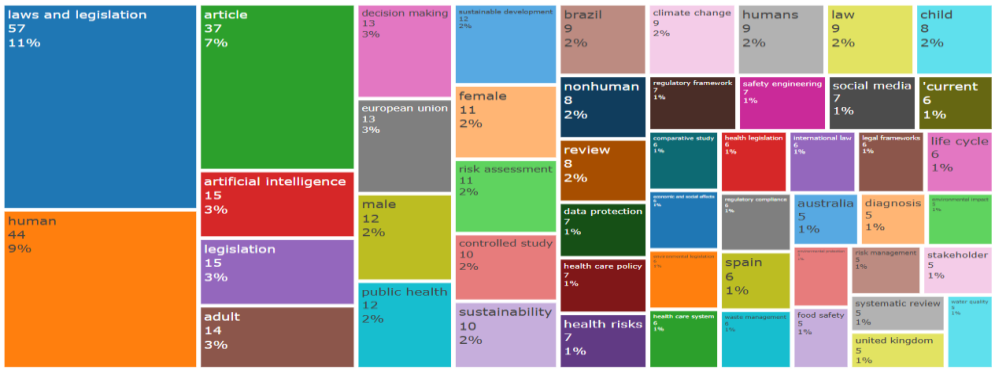

Figure 8. TreeMap

Figure 8 visualization provides a granular distribution of keyword frequency, offering a more quantitative complement to the previous word cloud. The field is clearly dominated by "laws and legislation" (57; 11%), confirming that regulatory discourse constitutes the intellectual core. The second most prominent term, "human" (44; 9%), reinforces a human-centric analytical framing, suggesting that legal scholarship is frequently contextualized within societal and demographic dimensions. A second tier of keywords—"article" (37; 7%), "artificial intelligence" (15; 3%), "legislation" (15; 3%), and "adult" (14; 3%)—indicates both methodological prevalence (publication types) and emerging thematic diversification, particularly the growing relevance of AI governance. The presence of "European Union" (13; 3%) highlights a geopolitical concentration, suggesting that EU regulatory frameworks are a major empirical or normative reference point. Mid-level clusters such as "decision making," "risk assessment," "public health," and "sustainability" (2–3%) illustrate the applied policy orientation of the field, bridging legal analysis with governance outcomes. Additionally, demographic segmentation (e.g., "male," "female," "child") and sector-specific concerns (e.g., "health care policy," "data protection") indicate increasing specialization. Smaller nodes (≤1%) reflect fragmented, niche subtopics, including environmental management and comparative legal studies. Overall, the treemap confirms a core-periphery structure, where legal-regulatory themes dominate, while AI, sustainability, and health policy represent expanding interdisciplinary frontiers.

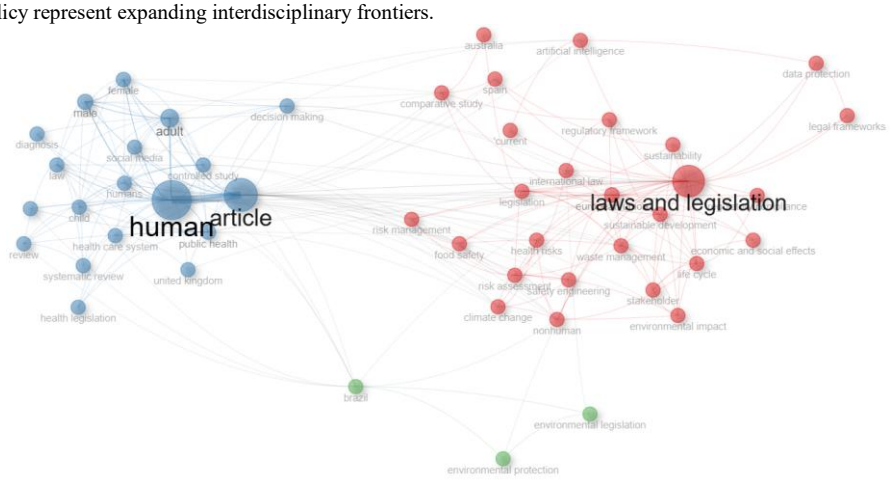

Figure 9. Co-Occurrence Network

This keyword co-occurrence network map reveals the structural relationships, clustering patterns, and knowledge flows within the research domain. Two dominant clusters are clearly visible. The red cluster, centered on "laws and legislation," represents the core legal-regulatory paradigm, strongly interconnected with themes such as sustainability, international law, regulatory frameworks, climate change, and economic and social effects. This indicates a macro-level governance orientation, where legal systems are analyzed in relation to global challenges and policy outcomes. In contrast, the blue cluster, anchored by "human" and "article," reflects a human-centric and health-oriented subfield, linking to terms like public health, healthcare systems, adult, female, and decision making. This suggests a micro-level analytical focus, emphasizing population-level implications and empirical health studies. The green cluster is relatively small and peripheral, focusing on environmental protection and environmental legislation, indicating a specialized but less integrated niche. Importantly, "article" and "human" function as bridging nodes, connecting the human-health discourse with the legal-regulatory core. However, the limited density of cross-cluster links suggests partial fragmentation, where interdisciplinary integration remains underdeveloped. Geographical nodes such as Brazil, Spain, and Australia indicate context-specific applications, though they are not central. Overall, the network demonstrates a dual-structure field: a dominant legal-policy core and a secondary human-health cluster, with emerging but weakly integrated environmental and sustainability dimensions.

4.4. Recommedations

The digital Transportation journey of the Special Region of Yogyakarta (DIY) from 2005 to 2025 demonstrates significant progress but also highlights areas requiring deeper institutionalization and sustainability. To strengthen future development, several recommendations can be made. First, digital Transportation must be embedded into formal regulations and bureaucratic routines, ensuring continuity beyond leadership changes and reducing reliance on sectoral coordination. Establishing a permanent cross-sectoral governance body under Diskominfo DIY would help consolidate efforts and institutionalize digital innovation. Second, human resource capacity should be enhanced through continuous professional development programs in advanced technologies such as AI, big data, and blockchain, while expanding digital literacy initiatives for both civil servants and citizens to bridge the digital divide. Third, sustainable funding mechanisms are essential; moving beyond annual APBD allocations to multi-year commitments and exploring public-private partnerships will secure long-term investment in

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infrastructure and innovation. Fourth, robust data governance and cybersecurity frameworks must be prioritized to align with national SPBE standards, protect citizen privacy, and build trust in digital services. Fifth, the Smart Province ecosystem should be expanded to include Smart Economy and Smart Branding, fostering collaboration with universities, startups, and communities to create innovation-driven development. Sixth, leadership and organizational culture must embrace Transportational approaches that encourage collaboration, adaptability, and innovation, while addressing hierarchical resistance through structured change management practices. Finally, monitoring and evaluation should be institutionalized by integrating KPI dashboards and performance indicators into RPJMD and SNI frameworks, supported by annual independent evaluations to measure progress and identify gaps. By embedding digital Transportation into long-term policy frameworks, strengthening institutional capacity, and fostering collaborative ecosystems, DIY can evolve from a Smart Province into a leading model of digital governance in Southeast Asia, ensuring resilience, inclusivity, and sustainability in its governance practices.

5 CONCLUSION

This study on the dynamics of digital Transportation in the Special Region of Yogyakarta (DIY) from 2005 to 2025 reveals that the region has undergone a gradual yet significant evolution from early e-government initiatives to the development of a comprehensive Smart Province framework. The findings highlight that regulatory reforms, leadership continuity under asymmetric decentralization, and institutional coordination through Diskominfo DIY have been pivotal in sustaining progress, while challenges such as hierarchical bureaucratic culture, limited funding sustainability, and uneven digital literacy remain persistent obstacles. Theoretically, this research contributes to the discourse on digital governance by framing Transportation as a long-term, co-evolutionary process shaped by the interaction of technological, organizational, and policy factors rather than a linear adoption of ICT. Empirically, it provides a detailed case study of DIY, demonstrating how local political structures and cultural contexts influence the rhythm and sustainability of digital Transportation. Practically, the study offers insights for policymakers on embedding digital Transportation into long-term regulations, strengthening human resource capacity, and institutionalizing monitoring frameworks to ensure resilience and inclusivity. However, the research is limited by its single-case design, which constrains generalizability, and by reliance on qualitative data that may not fully capture quantitative performance outcomes. Future research should expand comparative studies across regions with varying governance structures to test the applicability of the co-evolutionary framework, while methodologically integrating mixed approaches that combine longitudinal qualitative analysis with quantitative indicators of digital maturity and citizen trust. Additionally, further theoretical exploration is needed to refine models of digital Transportation in asymmetrically decentralized contexts, particularly in Southeast Asia, where cultural and political uniqueness strongly shape governance outcomes. By addressing these directions, future scholarship can deepen understanding of how digital Transportation unfolds in diverse institutional settings and strengthen pathways toward sustainable, citizen-centered digital governance.

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