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The Impact of Big Data Technology on Public Decision Making in Digital Governance: Literature Review

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ABSTRACT

***Purpose**: This study aims to examine and synthesize existing scholarly literature on the impact of big data technology on public decision making within the context of digital governance. It seeks to clarify how big data influences policy processes, administrative performance, and governance outcomes, while also identifying institutional and ethical conditions that shape its effectiveness.*

***Subjects and Methods:** The study adopts an integrative qualitative literature review design guided by the PRISMA framework. Academic articles were systematically identified from Scopus, Web of Science, and Google Scholar using predefined keywords related to big data, digital governance, and public decision making. Following identification, screening, and eligibility assessment, nine peer-reviewed studies were selected for in-depth analysis. Data were analyzed using thematic analysis and cross-study synthesis to identify recurring patterns, key themes, and relational mechanisms across studies.*

***Results:** The findings indicate that big data technology enhances evidence-based decision making by enabling predictive analytics, real-time analysis, and policy optimization. However, its impact is highly conditional, depending on mediating factors such as data quality, analytical skills, and institutional capacity. The literature also highlights significant challenges related to ethics, accountability, transparency, and unequal access to data and skills. These issues underscore the tension between data-driven efficiency and democratic governance principles.*

***Conclusions:** Big data technology functions as an enabling but non-deterministic force in digital governance. Its contribution to public decision making depends on supportive institutions, ethical safeguards, and inclusive governance practices that align technological innovation with public values.*

INTRODUCTION

Digital governance has emerged as a central paradigm in contemporary public administration, driven by rapid advances in information and communication technologies (Meijer et al., 2019). Governments across the world are increasingly adopting digital tools to enhance efficiency, transparency, and responsiveness in public service delivery. Within this transformation, data has become a critical strategic resource shaping how public institutions design policies, allocate resources, and interact with citizens.

Bena et al. (2025) said that, among the various technological developments influencing digital governance, big data technology has gained particular prominence. Characterized by high volume, velocity, and variety of data, big data enables governments to process and analyze large-

scale information generated from administrative records, social media, sensors, and digital platforms. This capability has the potential to fundamentally reshape public decision making by enabling more evidence-based, predictive, and real-time policy interventions (Babazadeh, 2025; Mir & Raza, 2025). Public decision making traditionally relied on limited datasets, expert judgment, and bureaucratic routines (Rayner, 2003).

While these approaches have long structured governance processes, they often suffer from delays, information asymmetry, and limited adaptability to complex social dynamics (Janssen & Van, 2016; Duit & Galaz, 2008). Big data technology introduces new analytical possibilities that can overcome some of these limitations by expanding the scope and depth of information available to policymakers. In the context of digital governance, big data is frequently associated with the promise of smarter government (Bertot et al., 2014). Through advanced analytics, machine learning, and data integration, public institutions can identify patterns, forecast trends, and evaluate policy outcomes with greater precision. This shift supports a transition from reactive governance toward proactive and anticipatory decision making.

Existing literature highlights multiple domains where big data influences public decision making, including urban planning, public health, taxation, transportation, and social welfare (Bibri, 2019; Hossin et al., 2023; Fredriksson et al., 2017; Song et al., 2017). For example, data-driven insights have been used to optimize traffic management, detect fraud, and monitor public service performance. These applications suggest that big data can enhance both the effectiveness and efficiency of governance systems.

However, the integration of big data into public decision making is not without challenges. Scholars have emphasized that technological capability alone does not guarantee improved governance outcomes. Institutional readiness, data quality, organizational culture, and regulatory frameworks play a crucial role in determining whether big data can be meaningfully translated into policy decisions (Olszak & Mach-Król, 2018).

One major concern discussed in the literature relates to data governance and accountability. The increased reliance on algorithmic analysis raises questions about transparency, explainability, and democratic oversight. When policy decisions are informed by complex data models, citizens and even public officials may struggle to understand how conclusions are reached, potentially undermining trust in government. Lăzăroiu et al. (2018) said that, Privacy and data protection issues also occupy a central place in debates on big data and digital governance. The collection and processing of large-scale personal data create risks related to surveillance, misuse of information, and violations of individual rights.

Literature emphasizes that without robust legal and ethical safeguards, big data-driven decision making may conflict with principles of democratic governance (Masoudi, 2025). Another critical issue identified in previous studies is the unequal capacity of governments to leverage big data technologies. While technologically advanced states can invest in sophisticated analytics and skilled personnel, developing countries often face constraints related to infrastructure, expertise, and financial resources. This digital divide affects how big data influences public decision making across different governance contexts.

Organizational and cultural resistance within public institutions further complicates the adoption of big data technologies (Tilly et al., 2025). Traditional bureaucratic structures may be reluctant to shift from experience-based decision making to data-driven approaches. Literature suggests that without changes in institutional norms and leadership commitment, big data initiatives risk becoming symbolic rather than transformative. The role of big data in enhancing policy effectiveness must also be examined critically (Babazadeh, 2025). While data analytics can improve accuracy and efficiency, decision making remains a political and normative process. Scholars caution that data-driven governance should complement, rather than replace, human judgment, public deliberation, and ethical reasoning.

Recent studies have increasingly focused on the relationship between big data and participatory governance. Digital platforms and data analytics can potentially enhance citizen engagement by incorporating feedback, complaints, and behavioral data into decision making (Raj et al., 2025). However, concerns remain regarding representation, bias, and the exclusion of digitally

marginalized populations. The growing body of literature on big data and digital governance reflects diverse theoretical perspectives, ranging from public administration and information systems to political science and ethics (Meijer, 2018).

Despite this diversity, existing research remains fragmented, with varying conclusions regarding the actual impact of big data on public decision-making processes. A systematic examination of the literature is therefore necessary to synthesize existing knowledge, identify dominant themes, and highlight unresolved debates. A literature review approach allows for a comprehensive understanding of how big data technology has been conceptualized, implemented, and evaluated within the field of digital governance (Fredriksson et al., 2017).

By reviewing prior studies, it becomes possible to assess not only the opportunities offered by big data but also the structural and institutional conditions that shape its effectiveness. This approach helps clarify whether big data-driven decision making contributes to more inclusive, transparent, and accountable governance or whether it risks reinforcing existing power asymmetries. Furthermore, a literature review can reveal gaps in empirical evidence, particularly in relation to developing country contexts and comparative governance systems.

Many existing studies focus on advanced economies, leaving limited understanding of how big data affects public decision making under conditions of institutional and infrastructural constraints. Accordingly, this study aims to review and synthesize the existing literature on the impact of big data technology on public decision making in digital governance. By analyzing key themes, challenges, and implications identified in prior research, this article seeks to contribute to a more nuanced understanding of the role of big data in shaping contemporary governance practices and to inform future research and policy development in this rapidly evolving field.

METHODOLOGY

Research Design

This study employs an integrative qualitative literature review to examine the impact of big data technology on public decision making within the context of digital governance. This research design is appropriate because it allows the integration and interpretation of diverse types of academic literature, including conceptual, theoretical, and empirical studies, in order to generate a comprehensive understanding of complex governance phenomena. Unlike purely systematic or statistical reviews, the integrative approach emphasizes analytical depth, thematic synthesis, and theory development, which aligns with the objective of this study to explore mechanisms, conditions, and implications of big data–driven decision making in the public sector. The qualitative orientation of the review enables an interpretive analysis of how big data technologies influence policy formulation, administrative processes, and institutional dynamics, rather than measuring effect sizes or causal relationships quantitatively. This design is particularly suitable for governance and public administration research, where contextual, ethical, and institutional factors play a critical role in shaping outcomes.

Literature Selection and Data Sources

The literature reviewed in this study was drawn from peer-reviewed academic journals indexed in reputable databases such as Scopus, Web of Science, and Google Scholar. Article selection was guided by relevance to the core themes of big data technology, digital governance, public sector decision making, analytics, and institutional capacity. Both seminal works and influential contemporary studies were included to ensure theoretical depth and temporal coverage. The inclusion criteria focused on studies that: (1) explicitly discussed big data, analytics, or data-driven technologies in public or governmental contexts; (2) examined implications for decision making, policy processes, or governance structures; and (3) were published in recognized academic outlets. Conceptual papers, qualitative studies, mixed-methods research, and systematic reviews were all considered appropriate, reflecting the integrative nature of the review.

Data Analysis Technique

Data analysis was conducted using qualitative thematic analysis combined with cross-study synthesis. Each selected article was carefully reviewed to extract key arguments, methodological

approaches, contextual settings, and principal findings related to public decision making and digital governance. These extracted elements were then compared across studies to identify recurring patterns, convergent themes, and contrasting perspectives. The analysis proceeded through three main stages. First, open coding was applied to identify central concepts such as evidence-based policymaking, institutional capacity, data quality, analytical skills, ethical risks, and accountability. Second, these concepts were grouped into broader thematic categories reflecting benefits, risks, and institutional factors associated with big data adoption in the public sector. Third, an integrative synthesis was performed to examine how these themes interact across different governance contexts, enabling the development of a coherent conceptual framework.

Development of the Conceptual Framework

The conceptual framework presented in this study was developed inductively from the synthesized findings of the reviewed literature. Rather than being imposed a priori, the framework emerged from the repeated relationships and mechanisms identified across studies. It illustrates how big data technology influences public decision making through mediating factors such as data quality and analytical skills, and how outcomes are shaped by benefits, risks, and institutional conditions. This framework serves both as an analytical tool for interpreting existing literature and as a theoretical contribution that can guide future empirical research on digital governance and data-driven public administration.

PRISMA-Guided Review Procedure

This study followed a PRISMA-guided qualitative literature review process to ensure transparency, rigor, and replicability in selecting and analyzing relevant studies. Although PRISMA is commonly associated with quantitative systematic reviews, it has increasingly been adopted in qualitative and integrative reviews to structure the identification, screening, and inclusion of literature in a systematic manner. During the identification stage, a comprehensive search was conducted across academic databases including Scopus, Web of Science, and Google Scholar. Keywords used in the search included combinations of “big data,” “digital governance,” “public decision making,” “data-driven policy,” “public sector analytics,” and “e-government.” This initial search yielded a broad pool of academic articles relevant to the intersection of big data technology and public governance. In the screening stage, duplicate records were removed, and titles and abstracts were reviewed to exclude articles that were not relevant to the public sector or decision-making context. Studies focusing solely on private-sector analytics, technical algorithm development without governance implications, or non-scholarly publications were excluded at this stage. The eligibility stage involved a full-text assessment of the remaining articles. Studies were evaluated based on predefined inclusion criteria: (1) relevance to big data or analytics in public or governmental settings; (2) explicit discussion of decision-making, policy processes, or governance outcomes; and (3) publication in peer-reviewed journals. Articles that lacked sufficient conceptual or empirical linkage to public decision making were excluded. Finally, in the inclusion stage, nine key studies were selected for in-depth qualitative analysis and synthesis. These studies formed the basis for the cross-study synthesis, thematic analysis, and conceptual framework development presented in the Results and Discussion sections.

Table 1. PRISMA-Based Literature Selection Process

PRISMA Stage	Description of Process	Number of Articles
Identification	Records identified through database searching (Scopus, Web of Science, Google Scholar) using predefined keywords	± 120 articles
Screening	Titles and abstracts screened; duplicates and irrelevant studies removed	± 45 articles
Eligibility	Full-text articles assessed for relevance to public decision making and digital governance	± 18 articles
Inclusion	Studies included in qualitative synthesis and analysis	9 articles

Integration with Qualitative Analysis

Unlike quantitative PRISMA reviews that aim for effect-size aggregation, this PRISMA-guided process was used to systematically narrow the literature pool while preserving conceptual richness. The final set of included studies was analyzed using thematic analysis and cross-study synthesis, enabling the identification of recurring patterns related to benefits, risks, institutional capacity, and ethical considerations in big data driven public decision making.

RESULTS AND DISCUSSION

To better understand the role of big data technology in shaping public decision making within digital governance, a comprehensive review of relevant literature was conducted. Nine key studies were selected based on their focus on big data, analytics, digital governance, and their implications for policy and administrative processes. These studies collectively provide insights into both the opportunities and challenges associated with implementing big data in government decision-making, including its effects on efficiency, transparency, evidence-based policymaking, institutional dynamics, and citizen engagement. The reviewed articles vary in scope, research design, and regional context, offering a rich perspective on the intersection of technology, governance, and public administration. Some studies primarily emphasize the conceptual and theoretical impact of big data (e.g., Kitchin, 2014; Janssen & Kuk, 2016), while others focus on empirical evidence or mixed-method analyses of adoption, infrastructure, and institutional factors (e.g., Chen et al., 2012; Zuiderwijk et al., 2015). Before discussing the key findings, Table 1 summarizes the selected literature, highlighting the authors, geographic context, study titles, research designs, and major results. This overview provides a structured foundation for the subsequent cross-study synthesis and thematic analysis.

Table 2. Overview of Reviewed Literature on Big Data and Digital Governance

No	Author	Origin	Title	Design	Key Results
1	Kitchin, R. (2014)	Ireland	Big Data, new epistemologies and paradigm shifts	Conceptual Review	Big data reshapes public decision-making by enabling predictive analytics and real-time policy responses, but raises concerns over data ethics, governance, and accountability.
2	Janssen, M. & Kuk, G. (2016)	Netherlands	The challenges and limits of big data algorithms in technocratic governance	Critical Analysis	Big data algorithms can enhance efficiency and evidence-based policymaking, but face limitations related to transparency, data quality, institutional capacity, and democratic accountability.
3	Meijer, A. (2015)	Netherlands	E-governance innovation: Barriers and strategies	Qualitative	Data-driven governance improves responsiveness, but may constrain democratic interaction if not

					institutionally embedded.
4	Chen, H., Chiang, R., & Storey, V. (2012)	USA	Business intelligence and analytics: From big data to big impact	Systematic Review	Big data analytics strengthens strategic decision-making through pattern recognition and forecasting, requiring advanced analytical skills and infrastructure.
5	Margetts, H. & Dunleavy, P. (2013)	United Kingdom	The second wave of digital-era governance: a quasi-paradigm for government on the Web	Comparative Analysis	Digital technologies enable faster decision-making and service integration, but institutional inertia often limits transformative outcomes.
6	Barry, E., & Bannister, F. (2014)	Ireland	Barriers to open data release: A view from the top	Conceptual Analysis	Institutional, legal, and cultural barriers hinder open data release, limiting its potential contribution to evidence-based policymaking.
7	Fountain, J. E. (2004)	USA	Building the virtual state: Information technology and institutional change	Institutional Analysis	The impact of digital data on decision-making is shaped more by institutional structures than by technology itself.
8	Zuiderwijk, A., Janssen, M., & Dwivedi, Y. K. (2015)	Netherlands	Acceptance and use predictors of open data technologies: Drawing upon the unified theory of acceptance and use of technology	Mixed-Methods Study	Open and big data enhance transparency and policy innovation, but benefits remain uneven due to skills and access disparities.
9	Sun, T. & Medaglia, R. (2019)	Denmark	Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare	Systematic Literature Review	Big data adoption faces recurring challenges related to privacy, interoperability, data governance, and organizational readiness.

Table 2 presents an overview of nine key studies that are thematically aligned with the title “The Impact of Big Data Technology on Public Decision Making in Digital Governance: Literature

Review." Collectively, the reviewed articles are highly relevant to the scope and intent of the study, as they examine big data, digital technologies, and data-driven systems within public sector and governance contexts. Although the articles employ diverse theoretical lenses and research designs, all of them address how large-scale data, analytics, or digital infrastructures influence governmental decision-making processes, policy formulation, and administrative performance. Several studies explicitly focus on big data and analytics (e.g., Kitchin, 2014; Chen et al., 2012; Janssen & Kuk, 2016), while others contribute indirectly by analyzing institutional, organizational, and governance conditions that shape the effectiveness of data-driven decision making (e.g., Fountain, 2004; Meijer, 2015; Margetts & Dunleavy, 2013). Taken together, the literature in the table coherently supports the research objective by illuminating both the opportunities and constraints of big data technology in digital governance, thereby aligning well with the study's central focus on public decision making.

Among the reviewed studies, Kitchin (2014), Janssen and Kuk (2016), and Chen et al. (2012) are the most directly aligned with the research title, as they explicitly conceptualize big data and analytics as transformative forces in public decision making. Kitchin (2014) provides a foundational theoretical discussion on how big data reshapes epistemologies and policy processes, while Janssen and Kuk (2016) critically examine algorithmic governance and its implications for transparency and accountability. Chen et al. (2012), in contrast, adopt a more managerial and analytical perspective, emphasizing the strategic value of big data for organizational and policy decisions. The remaining articles differ in emphasis and analytical depth: Meijer (2015) and Margetts and Dunleavy (2013) focus more broadly on digital governance and e-government innovation; Barry and Bannister (2014) and Zuiderwijk et al. (2015) concentrate on open data and adoption challenges; Fountain (2004) foregrounds institutional structures over technology; and Sun and Medaglia (2019) extend the discussion to AI-related governance challenges. These differences highlight variation in theoretical orientation, methodological approach, and analytical focus, while collectively enriching the literature review by offering complementary perspectives on how big data intersects with public decision making in digital governance.

Cross-Study Synthesis

After reviewing nine related articles, the following findings can be synthesized:

Big Data as a Tool for Public Decision-Making

Almost all studies (Kitchin, 2014; Chen et al., 2012; Janssen & Kuk, 2016) emphasize that big data enhances the government's ability to make evidence-based decisions, enabling trend prediction, real-time analysis, and public policy optimization.

Institutional Challenges

Several studies (Fountain, 2004; Margetts & Dunleavy, 2013; Barry & Bannister, 2014) indicate that the effectiveness of big data depends heavily on institutional capacity, system integration, and legal and regulatory rules. Technology without institutional support does not guarantee real transformation.

Digital Access and Skills Gap

Research by Zuiderwijk et al. (2015) emphasizes that while big data can improve transparency and policy innovation, the benefits are unevenly distributed due to disparities in skills and access to technology.

Ethical and Accountability Risks

Kitchin (2014) and Janssen & Kuk (2016) highlight the risks of big data related to privacy, algorithmic bias, and reduced democratic participation, suggesting that increased technological capacity must be accompanied by good governance.

Thus, the main findings suggest that big data acts as a catalyst for public decision-making, but its success is highly dependent on institutional factors, technical capacity, and accompanying regulations.

Conceptual Framework / Framework Diagram

Based on the synthesis of findings, the following conceptual framework describes the relationship between big data technology and public decision-making:

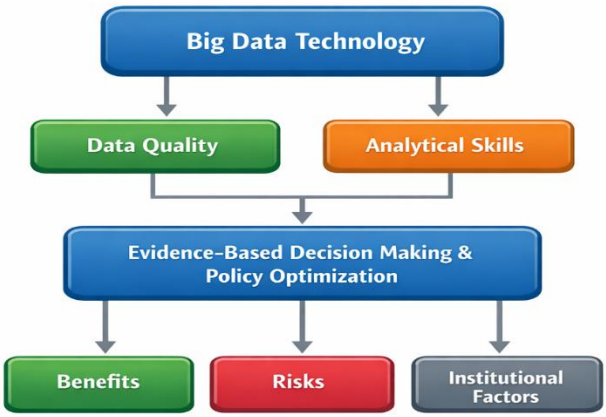

Figure 1. Framework Diagram

The conceptual framework illustrated in Figure 1 explains how big data technology influences public decision making within the context of digital governance through a set of interrelated mechanisms. At the core of the framework, big data technology functions as the primary driver that enables governments to collect, integrate, and process large volumes of diverse data in real time. However, its impact is not direct; instead, it is mediated by key organizational and technical factors that determine how data are transformed into actionable knowledge. The first mediating factor is data quality, which includes the accuracy, completeness, timeliness, and interoperability of data. High-quality data are essential for producing reliable analytical outputs and minimizing bias in policy decisions. When data quality is weak, the potential benefits of big data are significantly reduced, leading to misguided or ineffective decision making. This highlights that technological capability alone is insufficient without robust data governance and management practices.

The second mediating factor is analytical skills, referring to the capacity of public institutions to interpret data, apply analytical models, and translate results into policy-relevant insights. The framework emphasizes that human expertise remains central in data-driven governance. Even advanced analytical systems require skilled policymakers, analysts, and administrators who can contextualize findings, exercise judgment, and align data insights with public goals. Together, data quality and analytical skills shape the effectiveness of evidence-based decision making and policy optimization. This stage represents the transformation of raw data into informed decisions that improve policy design, implementation, and evaluation. When these mediating factors are well developed, big data supports more adaptive, responsive, and targeted public policies.

The framework further shows that the outcomes of data-driven decision-making manifest across three interconnected dimensions: benefits, risks, and institutional factors. Benefits include improved efficiency, transparency, and policy effectiveness, while risks encompass ethical concerns, privacy issues, algorithmic bias, and reduced democratic accountability. Institutional factors, such as regulatory frameworks, organizational culture, and leadership commitment, influence how benefits and risks are balanced and managed. The framework underscores that the impact of big data technology on public decision making is contingent and conditional. Rather than acting as a deterministic force, big data operates within a governance environment shaped by institutional capacity, ethical considerations, and human expertise. This conceptualization provides a holistic lens for understanding why big data initiatives succeed in some public sector contexts while producing limited outcomes in others.

DISCUSSION

Big Data and the Transformation of Public Decision Making

The findings of this literature review suggest that big data technology has fundamentally altered the logic of public decision making within digital governance. Rather than relying solely on historical data, intuition, or fragmented information, governments are increasingly positioned to use

predictive analytics, real-time data streams, and integrated datasets to inform policy choices. This transformation reflects a broader shift toward evidence-based governance, where decisions are justified through analytical outputs and data-driven insights. However, the literature indicates that this transformation is not automatic; the mere availability of big data does not guarantee better decisions. Its impact depends on how data are interpreted, integrated into policy processes, and aligned with public values. Thus, big data functions less as a deterministic solution and more as an enabling infrastructure whose governance determines its outcomes.

Institutional Capacity as a Determining Factor

A key discussion emerging from the reviewed studies is the central role of institutions in mediating the impact of big data on decision making. Institutional arrangements, organizational cultures, and administrative routines shape how data are collected, analyzed, and translated into policy action. The literature suggests that data-driven decision making often reproduces existing bureaucratic structures rather than transforming them. Where institutions lack coordination, interoperability, or strategic leadership, big data initiatives remain fragmented and underutilized. This reinforces the argument that digital governance is as much an institutional reform process as it is a technological one. Strengthening analytical capacity, fostering inter-agency collaboration, and aligning data governance frameworks are therefore essential to realizing the decision-making potential of big data.

Democratic Governance, Ethics, and Accountability

Another critical dimension highlighted in the discussion is the tension between data-driven efficiency and democratic governance principles. While big data promises faster and more accurate decision making, the literature raises concerns about transparency, accountability, and public oversight. Algorithmic decision systems can obscure how policy choices are made, shifting authority from human judgment to technical models that are not easily scrutinized by citizens or legislators. This creates risks of technocratic governance, where efficiency is prioritized over participation and deliberation. The discussion suggests that ethical governance frameworks, clear accountability mechanisms, and transparency-by-design are necessary to ensure that big data enhances rather than undermines democratic decision making in the public sector.

Inequality, Skills, and Uneven Policy Outcomes

The discussion also reveals that the benefits of big data in public decision making are unevenly distributed. Differences in digital skills, analytical expertise, and access to technological resources shape who can effectively use data and who remains excluded from its benefits. At an institutional level, this creates disparities between well-resourced agencies and those with limited capacity. At a societal level, it risks reinforcing existing inequalities if data-driven policies fail to account for marginalized groups or rely on incomplete datasets. The literature thus suggests that inclusive digital governance requires deliberate investment in capacity building, data literacy, and participatory approaches that allow diverse stakeholders to engage with data-driven policy processes.

Big Data within the Broader Digital Governance Ecosystem

Finally, the discussion positions big data as one component of a broader digital governance ecosystem rather than a standalone driver of reform. Its impact on public decision making is closely linked to other elements such as open data initiatives, artificial intelligence, regulatory frameworks, and public sector innovation strategies. The reviewed studies imply that big data is most effective when embedded within coherent governance models that balance innovation with control, efficiency with accountability, and automation with human judgment. From this perspective, the impact of big data on public decision making should be understood as a dynamic and evolving process, shaped by continuous interaction between technology, institutions, and societal expectations. The discussion reinforces that big data technology has significant potential to enhance public decision making in digital governance, but this potential is contingent upon institutional readiness, ethical safeguards, and inclusive governance practices. Without these supporting conditions, big data risks becoming a technical solution that delivers limited or uneven governance improvements.

CONCLUSION

Based on the results and discussion of this literature review, it can be concluded that big data technology plays a significant yet conditional role in shaping public decision making within digital

governance. The reviewed studies demonstrate that big data has the potential to enhance evidence-based policymaking, policy responsiveness, and administrative efficiency by enabling predictive analytics and real-time data use. However, this potential is not automatically realized and is heavily mediated by institutional capacity, data quality, analytical skills, and governance frameworks. The findings highlight that technological advancement alone is insufficient without supportive institutional arrangements, ethical safeguards, and transparent accountability mechanisms. Moreover, disparities in skills, access, and organizational readiness contribute to uneven policy outcomes and risk reinforcing existing inequalities. Overall, big data should be understood not as a deterministic solution but as an enabling component within a broader digital governance ecosystem, where its positive impact on public decision making depends on inclusive, well-coordinated, and ethically grounded governance practices.

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