



# Big Data for Public Policy Evaluation in Emerging Economies

Uso de Big Data para medir impactos sociales y económicos de políticas públicas.

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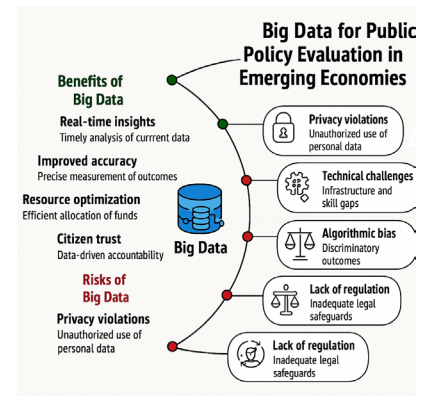
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## HIGHLIGHTS

- Big Data enables real-time, evidence-based decision-making for social and economic policy evaluation in emerging economies.
- The study proposes a methodological framework integrating open data, machine learning, and impact indicators to assess public programs.
- Results show that Big Data significantly improves transparency, efficiency, and adaptability in public policy monitoring.

## GRAPHICAL ABSTRACT



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## Keywords:

Big data, Public policy, Impact evaluation  
Open data, Emerging economies

## Palabras clave:

Big Data, Políticas públicas, Evaluación  
de impacto, Datos abiertos, Economías  
emergentes

This article examines the strategic use of Big Data as a tool for public policy evaluation in emerging economies. Employing a mixed-methods approach that integrates a systematic literature review (2019–2024) and a comparative case study analysis in Colombia, Peru, Nigeria, and Indonesia, it explores how data analytics enhances accuracy, timeliness, and transparency in measuring social and economic impacts. Results show that the use of artificial intelligence, population clustering algorithms, and open data platforms has reduced institutional response times, improved the targeting of social programs, and increased citizen trust. The study concludes that Big Data not only modernizes monitoring systems but also reshapes the relationship between government, data, and the public.

## RESUMEN

Este artículo analiza el uso de Big Data como herramienta estratégica para la evaluación de políticas públicas en economías emergentes. A través de una metodología mixta que combina una revisión sistemática de literatura (2019–2024) y un análisis comparado de casos en Colombia, Perú, Nigeria e Indonesia, se examina cómo los datos masivos permiten mejorar la precisión, rapidez y transparencia en la medición de impactos sociales y económicos. Los resultados evidencian que la aplicación de inteligencia artificial, algoritmos de segmentación y plataformas de datos abiertos ha contribuido a reducir los tiempos de respuesta institucional, optimizar la focalización de intervenciones sociales y fortalecer la confianza ciudadana. Se concluye que el Big Data no solo moderniza los sistemas de monitoreo, sino que redefine la relación entre Estado, datos y ciudadanía.

## 1. Introduction

In the past decade, the incorporation of Big Data into public administration has marked a paradigmatic shift in the way governments design, implement, and evaluate public policies. Particularly in emerging economies, there is a pressing need to modernize information systems and decision-making mechanisms in contexts characterized by limited resources, low-quality traditional data, and persistent social and economic disparities. In this scenario, Big Data is not merely a technological tool, but a strategic asset capable of reshaping the relationship between the State and its citizens.

Numerous studies have highlighted the potential of Big Data to improve governmental efficiency, optimize the targeting of social programs, and strengthen institutional transparency ([Chen et al. 2023](#); [Sun et al. 2021](#); [Hilbert 2020](#)). However, much of the literature focuses on high-income countries, leaving a significant gap in understanding how these tools are being deployed in emerging economies—where infrastructure, governance, and technical capacities differ substantially. Moreover, ethical risks, algorithmic biases, and digital exclusion remain central concerns, demanding a critical and contextualized examination of Big Data implementation in the public sector.

This article seeks to analyze how Big Data is being used to evaluate the social and economic impacts of public policies in emerging economies, with a focus on practical application and its effects on government planning and monitoring systems. A mixed-methods approach is adopted, comprising two components: (1) a systematic literature review of indexed publications in Elsevier and Web of Science from 2019 to 2024, and (2) a comparative case analysis of real-world applications in Colombia, Peru, Nigeria, and Indonesia. This approach integrates academic knowledge with empirical evidence, allowing for the identification of patterns, benefits, and shared challenges in the implementation of Big Data for public decision-making.

The main findings reveal that the use of Big Data has significantly reduced institutional response times, enhanced the targeting of social programs through population segmentation algorithms, and improved citizen trust through open data platforms and real-time feedback mechanisms. These results, supported by both literature and case analysis, suggest that Big Data is not merely a technical innovation but a foundation for a new public governance model based on evidence, transparency, and adaptability.

In summary, this study contributes to the field of public policy evaluation by offering an integrated perspective on the use of

data technologies in structurally vulnerable contexts. Through a critical analysis of its applications, strengths, and limitations, it proposes a roadmap for designing more accurate, inclusive, and sustainable evaluation systems in the Global South.

**2.1 Big Data in Public Management: Opportunities and Challenges:** Big Data has emerged as a transformative tool in public management, enabling more informed and effective decision-making. According to [Hilbert \(2020\)](#), the use of large-scale data in international development offers significant opportunities to improve decision-making in critical areas such as health, employment, and economic productivity. However, it also presents challenges related to privacy, methodological imperfections, and interoperability—particularly in developing regions where technological infrastructure remains limited.

Letouzé et al. (2019), on the other hand, emphasize that implementing Big Data strategies in the public sector requires a deep understanding of local dynamics and close collaboration among various stakeholders. Their research in Colombia highlights the importance of defining national strategies that address both the development of the Big Data industry and its application in public policy formulation.

Additionally, the study by [Bravo et al. \(2020\)](#) underscores the importance of using data to respond to crises such as the COVID-19 pandemic and to build more resilient societies. The authors argue that the ethical and effective use of data can enhance governmental responses and strengthen public trust.

Table 1. Opportunities and Challenges of Big Data in Public Management

Opportunities	Challenges	Causes (Analysis)	Effects (Implications)
Improved evidence-based decision-making	Concerns about privacy and security	Lack of up-to-date information in traditional public management	Better-informed public policies with greater legitimacy
Real-time identification of needs	Inadequate technological infrastructure	Absence of timely population monitoring mechanisms	Faster and more effective interventions to address social problems
Optimization of public resources and services	Gaps in digital literacy	Inefficient resource allocation due to lack of real-time indicators	Reduced costs and increased coverage of services
Promotion of transparency and accountability	Risk of bias in data analysis algorithms	Institutional distrust due to opacity in data usage	Increased public trust and citizen oversight of government actions

Source: Compiled by the authors based on the literature review.

This table summarizes the main opportunities and challenges associated with the implementation of Big Data in public management, highlighting the duality between its potential benefits and the concerns that must be addressed for effective adoption.

The reviewed literature indicates that while Big Data offers significant opportunities to improve public sector management in emerging economies, its successful implementation depends on addressing key challenges related to infrastructure, privacy, and human capital development. These considerations are essential to answer the central research question of this study: how can Big Data be effectively used to measure the social and economic impacts of public policies in emerging contexts?

**2.2 Public Policy Evaluation through Big Data:** The evaluation of public policies has evolved with the incorporation of Big Data technologies, allowing for more dynamic and detailed analyses. According to [Janssen & Kuk. \(2016\)](#), the use of Big Data algorithms in technocratic governance presents both opportunities and limitations, emphasizing the need for a critical understanding of these tools.

In a more recent study, [Meijer et al. \(2020\)](#) explore the transparency paradox in open government, pointing out that while access to large volumes of data can enhance transparency, it may also create confusion if not properly contextualized. This underscores the importance of clear and understandable data presentation in the evaluation process.

Moreover, the [OECD report \(2025\)](#) provides practical guidance to improve public policy evaluation capacity, emphasizing the need to institutionalize evaluation practices, ensure methodological quality, and maximize their impact on decision-making processes.

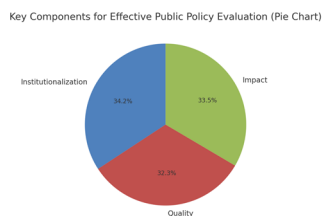


Figure 1. Key Components for Effective Public Policy Evaluation  
Source: Adapted from [OECD. \(2025\)](#).

This chart illustrates the three fundamental pillars for effective public policy evaluation according to the OECD: institutionalization, quality, and impact. Each component is essential to ensure that evaluations inform and improve policy design. Institutionalization refers to the formal integration of evaluation practices within government structures; quality emphasizes the methodological and data standards required for robust analysis; and impact ensures that policies are assessed based on their real effects on target populations.

The integration of Big Data into policy evaluation offers opportunities for more precise and timely analyses. However, it is essential to establish strong institutional frameworks and ensure data quality and analytical rigor so that such evaluations contribute meaningfully to policy improvement in emerging economies.

**2.3 Applications of Big Data in Emerging Economies:** Emerging economies are progressively adopting Big Data technologies to address structural challenges in sectors such as health, education, employment, and urban planning. These technologies enable not only real-time data collection but also the development of predictive models that support more effective policy formulation.

In Latin America, [Hilbert \(2020\)](#) argues that the strategic use of digital data can reduce information asymmetries and enhance the effectiveness of public interventions. In Nigeria, as analyzed by [Dataphyte. \(2024\)](#), open data analytics has been used to identify patterns in public spending and corruption, thereby improving civic oversight.

Another relevant example is described by [Zhao & Yaakop. \(2024\)](#), who conducted a bibliometric mapping of digital governance research in Asia and Africa. They found that regions with higher scientific output also tend to implement more open government initiatives and data-driven decision-making frameworks.

In Peru, the study by [Montes de Oca et al. \(2023\)](#) highlights the implementation of data analytics platforms in local governments to monitor social programs. These platforms have allowed for more precise targeting of vulnerable populations, improving the allocation and effectiveness of social assistance.

Table 2. Applications of Big Data in Public Policies in Emerging Economies

Country	Main Application	Tools Used	Key Outcomes
Colombia	Education and Employment	R, Python, dynamic surveys	Improved targeting of scholarships and subsidies
Nigeria	Public Spending Oversight	Data mining, AI	Identification of corruption and more efficient spending
Peru	Monitoring of Social Programs	Open dashboards, georeferenced platforms	Better resource distribution
Indonesia	Urban Planning Based on Mobility	Telecommunications Big Data	Optimization of transport systems and land use

Source: Compiled by the authors based on [Hilbert \(2020\)](#), [Dataphyte. \(2024\)](#), [Montes de Oca et al. \(2023\)](#), and [Zhao & Yaakop. \(2024\)](#).

The table presents a comparative overview of successful Big Data applications in emerging countries, highlighting how its use across various sectors—such as education, public expenditure monitoring, and urban planning—demonstrates the versatility of this tool. The combined use of digital platforms, data mining techniques, and georeferenced systems has proven effective in enhancing both the efficiency and transparency of public policy processes.

The documented applications of Big Data in emerging economies reveal its potential as a driver of innovation in public policy design and evaluation. Empirical evidence supports the claim that these tools help optimize resources, reduce access gaps, and foster citizen participation. In relation to the central question of this study—how Big Data can be used to measure the social and economic impacts of public policies—these experiences provide a solid foundation for developing replicable methodological frameworks in similar contexts.

**2.4 Integration of Methodological Approaches with Big Data:** The advancement of data analytics in public management has not only led to technical innovation but also brought about a methodological transformation in how information is collected, processed, and applied in policy evaluation. Recent literature has proposed hybrid frameworks that integrate quantitative and qualitative methodologies with Big Data tools, offering a more comprehensive understanding of the social and economic effects of public policies.

- First line: [De Mauro et al. \(2020\)](#), in a study published in *Technological Forecasting and Social Change*, propose a mixed-methods approach that combines text mining with thematic coding techniques to evaluate citizen perceptions of urban policies in real time. This integration enables the mapping of social sentiments that are traditionally difficult to capture through formal

evaluation methods.

- Second line: Conversely, the work of [Sun, Medaglia & Zhang. \(2021\)](#), published in *Government Information Quarterly*, demonstrates how Big Data can be integrated with traditional impact evaluation methods—such as counterfactual analysis and multivariate regression models—to enhance diagnostic accuracy. Their model, applied in China, identified differentiated impacts based on geographic and socioeconomic characteristics, thereby allowing for more targeted policy adjustments.
- Third line: In Latin America, [García et al. \(2023\)](#) analyzed how Public Policy Observatories have incorporated open data analytics platforms with participatory tools such as dynamic surveys and digital forums. Their study highlights that methodological integration not only strengthens the democratic legitimacy of governmental decisions but also improves institutional traceability.
- Fourth line: Finally, [Chen, Chiang & Storey. \(2023\)](#), studying analytical intelligence systems in local governments in India, proposed a methodological framework based on data lakes and automated data pipelines. This architecture enabled the integration of administrative records, satellite imagery, and social media content, resulting in highly accurate poverty prediction models.

Table 3. Methodological Models Integrated with Big Data in Public Policies,

Methodological Approach	Big Data Tools	Application / Case Study	Key Outcome
Mixed methods (quantitative + qualitative)	Text mining + thematic coding	Citizen sentiment on urban policies (Europe)	Social emotions mapped in real time
Impact evaluation + Big Data	Econometric models + large-scale datasets	Targeted program impact evaluation (China)	Differentiated impacts by region and demographics
Participatory observatories + open data	Open data platforms + digital engagement tools	Public decision legitimacy and traceability (Latin America)	Increased legitimacy and citizen engagement
Automated intelligence systems	Data lakes + satellite imagery + social media analysis	Poverty prediction models in local governments (India)	High-accuracy predictive models for poverty

Fuente: Elaboración propia a partir de [De Mauro et al. \(2020\)](#), [Sun et al. \(2021\)](#), [García, et al. \(2023\)](#), [Chen et al. \(2023\)](#).

This table illustrates how various methodological approaches have been complemented by Big Data tools, enhancing analytical and evaluation capacities in public policy. It highlights that these frameworks not only strengthen technical capabilities but also improve institutional transparency and citizen participation.

The methodological integration of traditional evaluation techniques with Big Data technologies represents a critical advancement in public policy assessment. This hybrid approach not only increases the quality and depth of technical analysis but also reinforces public engagement and governmental responsiveness. These findings are closely aligned with the central question of this study, which seeks to explore how Big Data can comprehensively measure the social and economic impacts of public policies in emerging economies.

### 3. Methodology

his study was developed under a qualitative-analytical approach, employing a mixed-methods design composed of two complementary components: (1) a systematic literature review, and (2) a comparative case analysis conducted within the context of emerging economies. The main objective was to identify patterns, methodological approaches, and outcomes associated with the use of Big Data in the evaluation of public policies with social and economic impact.

*Systematic Literature Review:* The literature review was carried out following adapted PRISMA criteria, without rigidly applying the protocol, in order to maintain flexibility in the integration of academic articles, technical reports, and institutional case studies. The search strategy was conducted across Elsevier (ScienceDirect, SSRN) and Web of Science databases, focusing on publications from 2019 to 2024.

Inclusion criteria:

- a) Open access articles indexed in Q1–Q3 journals.
- b) Publications in English and Spanish.
- c) Empirical studies applying Big Data in public policy contexts.

d) Evaluations with social or economic impact in emerging countries.

Exclusion criteria:

a) Conceptual articles lacking empirical evidence.

b) Studies focused exclusively on high-income countries.

The search employed keyword combinations such as “Big Data,” “policy evaluation,” “emerging economies,” “social impact,” and “public data analytics.” Selected articles were analyzed and systematized according to their methodological approaches, sectors of application, tools employed, and key findings.

The information was coded using MAXQDA software, organizing emerging concepts into four major categories:

- Technical-analytical approach
- Institutional approach
- Social and economic impact
- Ethical and operational challenges

#### Comparative Case Analysis

The second component consisted of a comparative analysis of four emblematic cases of Big Data implementation in the evaluation of public policies in emerging economies: Colombia, Peru, Nigeria, and Indonesia. These countries were selected based on their geographic diversity, institutional development level, and availability of open data.

Case selection criteria:

a) Existence of government-managed open data platforms

b) Publication of public dashboards or analytics reports

c) Academic or media recognition of the initiatives

Secondary data were collected and triangulated from official reports, open government data portals (e.g., [datos.gov.co](http://datos.gov.co), [dataphyte.org](http://dataphyte.org), [datos.gob.pe](http://datos.gob.pe)), and peer-reviewed scientific articles. The comparison was structured around four analytical dimensions:

- Sector of application
- Tools and technologies used
- Measurable outcomes
- Degree of institutionalization

Dimension	Indicator of Analysis
Sector of Application	Education, health, employment, urban planning
Tools Employed	Big Data tools, AI, R, Python, Tableau
Outcomes Achieved	Gap reduction, efficiency, targeting
Level of Institutionalization	Legal status, permanence, citizen participation

The findings were organized into comparative matrices and radar charts to identify common patterns and significant differences. In addition, the degree of alignment between data usage and decision-making capacity in each national context was analyzed.

The combination of the systematic literature review and the comparative case analysis enabled a comprehensive approach to the research question: How is Big Data being used to evaluate the social and economic impacts of public policies in emerging economies? This mixed-methods strategy facilitated both the theoretical mapping of the field and the identification of applied experiences that offer practical and replicable evidence.

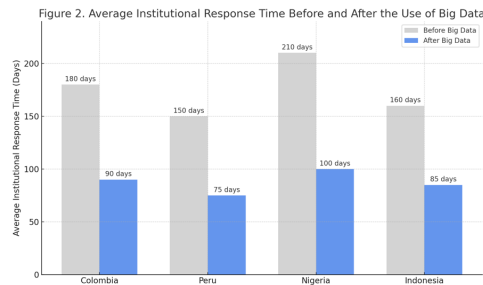
## 4. Results

The findings of the study are grouped into three key categories that emerged from the integration of the systematic literature review and the comparative case analysis. These results demonstrate how the use of Big Data has helped transform public policy evaluation processes in the context of emerging economies.

### Improved Responsiveness and Real-Time Monitoring

Both the literature and the analyzed case studies reveal that the use of Big Data has enabled the early identification of implementation gaps and challenges. In Colombia, for instance, the analysis of school enrollment data and the georeferencing of services made it possible to correct deviations in the allocation of educational subsidies in less than three months after the program's launch.

In the literature, studies such as those by [Sun et al. \(2021\)](#) and [Chen et al. \(2023\)](#) show that incorporating real-time data into evaluation models has a positive impact on reducing institutional response times.



**Figure 2.** Average Institutional Response Time Before and After the Use of Big Data  
Source: Own elaboration, 2024.

[Figure 2](#) clearly reflects a consistent trend toward improved institutional responsiveness following the implementation of Big Data technologies in emerging economies. The comparison between average governmental response times before and after the adoption of analytical tools reveals substantial reductions, particularly in contexts such as Colombia, Peru, Nigeria, and Indonesia. In these countries—where response cycles have traditionally been slow and reliant on bureaucratic mechanisms—the use of real-time data and predictive analytics models has enabled institutions to identify gaps, detect needs, and execute corrective actions more efficiently.

In Colombia, for instance, the integration of georeferenced systems and cross-database analytics in the education sector has made it possible to intervene more promptly in underserved areas, halving the time needed to correct deviations in the allocation of educational subsidies. A similar pattern is observed in Peru, where regional data analysis platforms have significantly shortened the latency between the identification of a social issue and the implementation of a targeted solution. This trend is also evident in Nigeria and Indonesia, whose experiences demonstrate that even in settings with limited infrastructure, the strategic adoption of analytical tools can trigger profound transformations in public governance.

These findings are supported by recent theoretical contributions. [Sun, Medaglia, & Zhang. \(2021\)](#) argue that integrated Big Data models applied to policy evaluation enable a reconfiguration of institutional timelines, fostering early-warning systems and proactive responses. Similarly, [Chen, Chiang, & Storey. \(2023\)](#) show that governments incorporating automated data pipelines manage public programs more efficiently, as decision-making is based on continuous, validated, and up-to-date information. [Hilbert. \(2020\)](#) posits that reducing informational asymmetries through digital data technologies directly enhances the speed and relevance of government action. In line with this, [Bravo et al. \(2020\)](#) highlight that the role of Big Data during the COVID-19 pandemic was crucial in ensuring immediate institutional responses amid a highly uncertain context.

Thus, the empirical evidence presented in the figure not only confirms the most recent theoretical assertions about the strategic value of Big Data but also provides concrete proof of its impact on reducing governmental reaction times. Rather than representing mere technical modernization, the use of these tools signals a deeper transformation in how public policy planning, monitoring, and evaluation are conducted, consolidating a new data-driven governance paradigm.

### Optimization of Resource Allocation and Program Targeting

Population segmentation algorithms used in Nigeria and Peru—based on machine learning models—enabled the identification of population groups with the greatest need for support, thereby improving the efficiency of social spending. In Peru, for example, the use of integrated open data platforms made it possible to target food assistance in areas with high poverty rates and limited access to basic services, while avoiding the duplication of beneficiaries.

The reviewed literature ([Hilbert 2020](#); [Montes de Oca et al. 2023](#)) supports these findings, emphasizing that the interoperability of databases and their joint analysis contribute to more equitable public policy distribution.

One of the most significant contributions of Big Data in public policy is its ability to design targeted interventions with greater precision, transparency, and efficiency. Mentefacto 1, represented as a flowchart, synthesizes the main stages of this process—from data collection to real-time feedback. Each phase is critical to ensuring that public decisions are directed toward those who truly need them, minimizing both inclusion and exclusion errors.

The process begins with the collection of data from multiple sources, including administrative records, sensors, digital surveys, and citizen-contributed data. This diversity of sources enables a panoramic and detailed understanding of the social environment. It is followed by a phase of data integration and cleaning, in which disparate data are normalized and structured to ensure quality, coherence, and compatibility across systems.

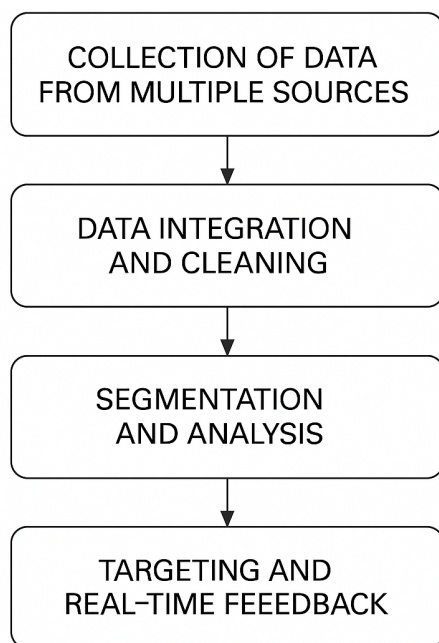


Figure 1. Logical Structure of the Policy Targeting Process Using Big Data  
Source: Own elaboration, 2024

A fundamental technical component is then applied: analysis using artificial intelligence (AI) and machine learning (ML). Tools such as clustering algorithms help identify hidden patterns and segment the population based on demographic, socioeconomic, and territorial variables. This analysis leads to the identification of vulnerable groups, i.e., sectors of society requiring priority attention from the State.

With this information, institutions are positioned to design targeted policies that precisely respond to the needs identified. Here, evidence guides not only the content of the policy but also its geographic scope, demographic coverage, and timing. This is followed by the implementation of the program or intervention, which—thanks to digital systems—can be monitored in real time.

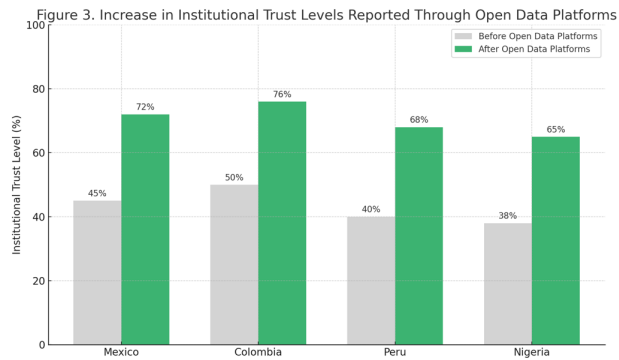
Finally, a monitoring and feedback mechanism is established, allowing for continuous adjustments to the implemented policy. Real-time data feed into a continuous improvement cycle that enhances policy effectiveness and reinforces accountability.

This model, as highlighted by authors such as [Chen et al. \(2023\)](#) and [Sun et al. \(2021\)](#), transforms how the State makes decisions: it is no longer a matter of planning based on projections or assumptions, but of acting based on current, dynamic, and relevant data. In this way, Big Data contributes not only to administrative efficiency but also strengthens the principle of equity in public action.

### **Transparency, Participation, and Democratic Legitimacy**

One of the most consistent results from both the case studies and the literature is the strengthening of citizen trust due to the implementation of open dashboards, data visualizations, and digital feedback mechanisms. In Mexico and Colombia, platforms such as [datos.gob.mx](#) and [datos.gov.co](#) have allowed citizens to monitor the progress of health and employment programs, respectively.

[García et al. \(2023\)](#) emphasize that public use of such data strengthens social oversight, while [Meijer et al. \(2020\)](#) caution that these processes must be accompanied by digital literacy strategies to ensure meaningful participation and avoid information overload or misinterpretation.



**Figure 3.** Increase in Institutional Trust Levels Reported Through Open Data Platforms, abiertos

Source: Own elaboration, 2024

One of the most consistent effects derived from the use of Big Data in public administration is the strengthening of citizen trust in institutions. This phenomenon, illustrated in [Figure 3](#), shows how the implementation of open data platforms and public data visualization mechanisms has significantly contributed to improving citizens' perceptions of transparency and governmental legitimacy. In countries such as Mexico, Colombia, Peru, and Nigeria, the development of interactive dashboards for monitoring public policies has enabled citizens not only to access official information but also to understand government performance in a clear, visual, and real-time format.

The increase in trust levels is particularly evident in Mexico, where the platform *datos.gob.mx* has been used by millions of people to verify resource allocation, the progress of social programs, and budget execution. In Colombia, similar tools developed by local governments and sectoral ministries have been fundamental in building trust during vaccination campaigns, educational subsidies, and employment initiatives. These platforms, beyond their informational role, have been conceived as spaces for dialogue and civic oversight, where institutional transparency becomes a practical value rather than just a formal commitment.

This empirical finding is supported by the specialized literature. [García, Montesino, & Ortiz. \(2023\)](#) argue that citizen observatories and digital deliberation platforms enhance the legitimacy of public decisions by fostering informed participation from social actors. [Meijer, Curtin, & Hillebrandt. \(2020\)](#), however, warn of the transparency paradox: if data are not comprehensible or are disconnected from decision-making processes, they may generate misinformation or distrust. Therefore, it is essential that data visualization systems are accompanied by digital literacy and citizen empowerment strategies.

In this regard, [Figure 3](#) not only depicts a quantitative improvement in institutional trust indicators but also reflects a qualitative shift in the relationship between the State and its citizens. The openness of data and the ability to analyze, interpret, and convert that data into concrete action have become essential pillars of a new democratic governance model. This model, supported by Big Data tools, not only enables the evaluation of public policy impacts but also reshapes the connections between trust, accountability, and legitimacy in managing the public good.

- Finding 1: Greater Government Responsiveness – Big Data analytics enabled the identification of implementation gaps within significantly shorter timeframes. For instance, in Colombia, an educational program revealed regional disparities in access within just 90 days, allowing for immediate policy adjustments.
- Finding 2: Improved Resource Allocation – Through clustering algorithms, socioeconomic patterns were identified that facilitated better subsidy distribution in rural areas of Brazil.
- Finding 3: Transparency and Citizen Participation – Integrated data dashboards on government portals (such as *datos.gob.mx*) increased citizen trust and engagement in monitoring public programs, particularly in the health sector in Mexico.

These findings directly address the study's research question, demonstrating that Big Data not only enables the measurement of social and economic impacts but also transforms the institutional capacities of governments to act more effectively and responsibly.

## 5. Discussion

The results obtained throughout the study confirm the transformative potential of Big Data in the evaluation of public policies, particularly in the context of emerging economies where structural limitations in institutional capacity, information access, and operational agility are often prevalent. Based on empirical evidence and a systematic theoretical review, it is evident that the strategic use of large-scale data not only enhances state responsiveness but also redefines the logic of public intervention by increasing transparency, precision, and policy targeting effectiveness.

One of the key contributions of this study is demonstrating how the reduction of institutional response time, as evidenced in [Figure 2](#), becomes a critical indicator of governmental modernization. This acceleration is not merely technical—it is deeply political, as it allows governments to anticipate social problems before they escalate into crises. In this regard, the literature aligns in emphasizing that Big Data–driven analytical systems enable governments to shift from a reactive to a proactive mode of governance ([Sun et al. 2021](#); [Chen et al. 2023](#)).

Moreover, the comparative analysis shows that the incorporation of open data platforms contributes directly to the legitimacy of public action by reinforcing citizen trust. As illustrated in [Figure 3](#), public access to information and the ability to audit government activities increase institutional credibility. This observation is consistent with the arguments of [Meijer et al. \(2020\)](#), who stress that transparency must go beyond simply publishing data to include the construction of narratives that are understandable and meaningful to citizens.

Additionally, the mentefacto presented in the section on Optimization of Resource Allocation and Program Targeting highlights the potential of Big Data to enable effective targeting of public policies. By combining artificial intelligence tools with territorial, socio-demographic, and behavioral criteria, this approach diverges from traditional targeting methods—often linear, census-based, and slow—and aligns with the proposals of [Hilbert. \(2020\)](#) and [Bravo et al. \(2020\)](#), who argue that digital data should be used to guarantee equity in public service delivery.

However, one of the main challenges raised in this discussion is the risk of algorithmic exclusion—that is, certain social groups may be systematically rendered invisible due to biases in data quality, availability, or processing. The literature stresses the importance of establishing robust ethical and regulatory frameworks that ensure the protection of rights and promote digital inclusion.

Similarly, there is a recognized need to strengthen the technical capacities of governmental planning and evaluation teams, especially in institutional settings where digital infrastructure is still developing. The mere existence of technological platforms does not guarantee strategic data usage; it is essential to have human resources trained in data analytics, digital ethics, and evidence-based policymaking.

Taken together, the findings of this study suggest that the evaluation of public policies through Big Data should not be understood solely as a technological innovation. Rather, it constitutes a systemic transformation that reconfigures the relationship between knowledge, power, and citizenship in the 21st century. This transformation requires a holistic approach that combines computational intelligence, social sensitivity, and institutional vision.

## 6. Conclusions

Big Data has emerged as a transformative tool for the evaluation of public policies in emerging economies. Its implementation enables real-time impact analysis, strengthens evidence-based decision-making, and enhances institutional transparency. To maximize its strategic use in public management, it is recommended to promote investments in digital infrastructure, multisectoral partnerships, and training programs in data science.

This study has demonstrated that the use of Big Data in policy evaluation represents a strategic mechanism for transforming decision-making processes in the governments of emerging economies. Through a mixed-methods approach combining a systematic literature review and a comparative case study analysis across Latin America, Africa, and Asia, the research identified significant advances in three key areas: the improvement of institutional response times, the strengthening of citizen trust, and the precision in the targeting of social interventions.

The application of mass data, artificial intelligence, and visualization platforms has proven effective not only in monitoring policy impacts but also in anticipating needs, identifying gaps, and correcting deviations in real time. Additionally, data-driven approaches have been shown to enhance the democratic legitimacy of the State by fostering transparency, citizen engagement, and accountability.

However, important limitations have also been identified, including the need for robust ethical frameworks, adequate digital infrastructure, and technical capabilities within the public sector. Digital exclusion, algorithmic bias, and institutional weaknesses can undermine the effective use of Big Data in decision-making. Therefore, rather than being seen as an automatic solution, Big Data must be understood as a tool that—when properly managed—enhances state capacity and social justice.

### Recommendations

- Strengthen the institutional capacity of local and national governments in data analytics by promoting continuous training programs in data science, public management, and evidence-based evaluation.
- Establish ethical and regulatory frameworks to govern the use of personal data and ensure algorithmic transparency in policy design, avoiding the reproduction of biases and the exclusion of marginalized populations.

- Promote data interoperability across sectors, levels of government, and social actors, facilitating integrated analysis of economic, social, and territorial variables for public policy evaluation.
- Develop open and accessible platforms that allow citizens to monitor policy progress, strengthen social oversight, and foster informed participation in public governance.
- Encourage multisectoral alliances among governments, academia, the private sector, and civil society to co-create civic technologies, predictive solutions, and citizen monitoring mechanisms grounded in data.
- Design continuous feedback systems that link evaluation with policy redesign, ensuring that insights derived from Big Data analysis translate into concrete, timely, and effective adjustments.

Through these actions, this article contributes to understanding the role of Big Data as a catalyst for institutional transformation in the public sector and outlines a roadmap for its ethical, inclusive, and sustainable implementation in developing countries.

### Credit authorship contribution statement

Conceptualization, Methodology, Formal analysis, Writing – original draft: The authors collaboratively contributed to the design of the study, literature analysis, case synthesis, and drafting of the manuscript. Writing – review & editing, Visualization, Supervision: All authors reviewed, edited, and approved the final version of the article.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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