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A Systematic Review of the Data-Driven Public Policy Making in Indonesia

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Abstract

Decision-making for public policy formulation in Indonesia has undergone significant changes from year to year, one of which is due to the effects of digital transformation. Big data is a part of digital transformation that has a direct correlation with public policy formulation in Indonesia. This research aims to identify the utilization of big data in decision-making for public policy formulation in Indonesia. The matters discussed in this research include the decision-making process in formulating public policy in Indonesia using big data analysis, as well as the effectiveness, efficiency, and openness of public policies resulting from data-driven public policy in Indonesia. This research uses the Systematic Literature Review (SLR) method by collecting various related research documents into a database using the PRISMA (Preferred Reported Items for Systematic Reviews and Meta-Analysis) research procedure. The utilization of big data in decision-making for public policy formulation in Indonesia has proven that the policies formulated are more effective and efficient because they utilize the data available in big data analysis.

Keywords:

decision making; big data analytic; policy effectiveness

Introduction

The utilization of big data in state practice is one of the new paradigms in public administration studies. Its presence can change the way the government manages, organizes, and promotes various strategic decisions through information inputs from big data (Ju et al., 2018; Ulil Amri, 2021). More than that, big data can transform public administration practices in a form that is more effective, efficient, and able to give a positive impression to the public if implemented wisely and accurately (Arnaboldi & Azzone, 2020; Hakim et al., 2021). The digitization of many facets of human existence and the quick advancement of information technology (IT) are the main causes of the process of big data integration in government operations.

The existence of data sets gave rise to the term "big data" sets in the form of repositories caused by the explosive increase in the amount of global data (Pankowska, 2020). Not only about the size of the data, but big data also refers to the variety, speed, and accuracy of the data (Elgendy

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& Elragal, 2016). Therefore, with the complexity of big data, a special analysis process is needed to get the desired information. Big data can provide benefits if it has gone through an analysis process called "Big Data Analytics" (Hakim et al., 2021; Ishwarappa & Anuradha, 2015). The analysis has gone through several big data phases such as Big Data generation, Big Data acquisition, and Big Data storage (Chen et al., 2014). Big Data Analytics involves various analysis techniques such as forecasting market trends, products, and services that are beneficial to the private sector as well as the public sector.

In the public sector, big data analytics can extract various information from data sets to support strategic decision-making (Abdillah et al., 2023; Hakim et al., 2021; Klievink et al., 2017). In addition, the use of information from the results of big data analytics can also help the government in planning and implementing effective and efficient public policies. This is because the government can more easily understand what the public wants and expects so that it can target according to public needs (Azzone, 2018; Goyal et al., 2022; Joseph & Johnson, 2013; Panagiotopoulos et al., 2017). The application of big data to public policy has been noted by academics through various relevant research results, such as in the fields of cyber security (Yang et al., 2019), public health (Saunders et al., 2020), smart city development (Ju et al., 2018), transportation (Iliashenko et al., 2021; Montoya-Torres et al., 2021), economy (Bello, 2022), environment (Li et al., 2021), even in governance itself (Hossin et al., 2023).

Governance that utilizes the results of big data analysis will form a smart governance concept. The concept of smart governance needs to adopt technology to make changes to traditional patterns that include digital platforms and innovations to improve public services (Kaiser, 2024). Smart governance can be implemented into three elements of governance, are services, bureaucracy, and policies.

The flow of smart governance includes the input, process, and output of an information system that will provide feedback to policyholders. Later, policyholders will easily formulate and evaluate a particular policy according to the results of data analysis based on the policy to be made (Nursetiawan & Putra, 2021). By implementing smart governance, transparent governance and data openness to the public can be realized. In addition, not only policyholders can be involved in government decision-making, but the community can also be involved in it and adjust to the needs of a particular policy (Mutiara et al., 2018).

The Indonesia government has made extensive use of big data. The Indonesian government uses the idea of smart governance to bring innovation and transparency to the process of state administration. This is also inseparable from data governance which is the main component of smart governance. The real implementation of big data in smart governance can be

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seen from several stages, namely infrastructure changes, cultural shifts and the establishment of trust through effective government, data-driven, customized public services, information sharing, and collaboration (Thamjaroenporn & Achalakul, 2020). On the other hand, the Government of Indonesia utilizes big data in the concept of smart governance with the aim of (1) Improving public services obtained from public feedback and criticism through social media and official websites; (2) Finding alternatives to problems inferred from existing data; and (3) Providing administrative assistance and auditing government funds (Sanjaya & Sulistyo, 2015).

With its enormous potential, the use of big data and the process of analyzing it has almost become an important part of the government sector. Even in Indonesia, there has been an increase in the involvement of big data analytics in overcoming various problems such as disasters and pandemics by government agencies (Wahyunengseh & Hastjarjo, 2021). When viewed in its application to the policy formulation process, big data will help realize evidence-based policies (Martins, 2019). However, applying big data in government is not as straightforward as it seems. Several things make big data a complex and difficult entity (Abuljadail et al., 2023). For example, the rigid nature of government bureaucracy with low technology literacy rates is an obstacle to big data integration. So that the authority must at least have knowledge and skills in data science (Spence, 2021). In a further study, when the big data integration process is not well managed and the introduction is inadequate, the expected decision-making will run very slowly (Heryani, 2023). Another challenge that becomes another concern is the gap in big data analysis to provide biased conclusions and problems with people's privacy (Desouza & Jacob, 2014). Thus, it is imperative that big data be used, particulary in the public sector reviewed further so that it can be useful. One of them is the evaluation and input carried out through various research by academics.

Numerous research studies have been carried out to investigate the use of big data in the public sector. Nevertheless, there are still unanswered questions and a dearth of throught study on Indonesia’s use of bog data potential in public policy formulation. Therefore, this research will try to reveal various things related to the application of big data in Indonesia’s policy-making process. This research is conducted to close the research gap that occurs. The research questions that limit the discussion in this research are:

RQ 1: How is the decision-making process in formulating public policy in Indonesia using big data analysis?

RQ 2: What is the effectiveness, efficiency, and openness of public policies resulting from the results of data-driven public policy in Indonesia?

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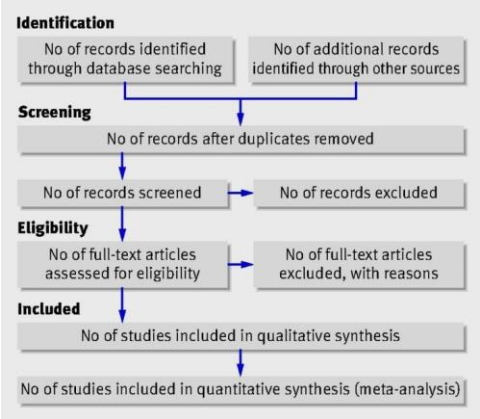
The results of this study can be used to better understand numerous public policy studies, the role big data plays in the process of analyzing public policy and various indicators, that can make policies more effective, and various problems that arise in the process of utilizing big data in public policy analysis. Later, these results will also help and support policymakers including the Indonesian people in making various evidence-based public policies.

Methods

This paper's research methodology is the usage of a systematic review approach (SLR) that combines sources that are reliable and appropriate to the research topic. SLR begins by first defining the problem formulation and relevant keywords to search and retrieve content from the database to be presented in the research. A systematic literature review was conducted by identifying, evaluating, and interpreting all available research relevant to the research question and topic. The use of this method is based on the reason that SLR can (1) provide suggestions for more in-depth research because it has information related to gaps in current research, (2) summarize information related to empirical evidence in various studies, and (3) present a framework so that the research activities carried out are appropriate and have novelty (Kitchenham & Charters, 2007). The procedure used in this study is PRISMA (Preferred Reported Items for Systematic Reviews and Meta-Analysis) which is a trusted procedure for systematic reviews of the literature. The PRISMA procedure consists of four main processes consisting of identification, screening, eligibility testing, and inclusion (Moher et al., 2009).

Figure 1.

SLR Process



Source: (Moher et al., 2009)

Research Design

This study employed a systematic literature review approach that involved formulating a procedure and looking for the most crucial data in the literature. To minimize the potential for

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study bias, a predefined process must be followed. The researcher used PRISMA to help with the design of the study, which complies with the four requirements of identification, screening, eligibility, and inclusion.

Eligibility Criteria

The eligibility criteria contain information on articles selected in the systematic literature review based on keywords that match the research topic. The criteria set are keywords, language, and publication period. Only English-language journal articles in the publication period from January 2024 to September 2024 were selected for this study.

Research Protocol Development

To make sure the study was carried out byscientific principles, a research protocol was created (Table 1). In detail, the data search for scientific articles within the last 20 years has resulted in 11 selected journal articles that will be reviewed to answer the research questions set.

Table 1.

Summary of the Research Protocol

No	Items	Descriptions
1	Database	Scopus and Google Scholar
2	Criteria of publication	Articles published in English
3	Period of publication	From January 1, 2004 to September 30, 2024
4	Keywords for search	Big data, policy, public policy, indonesia
5	Fields of search	Title, abstract, and keywords
6	Criteria for inclusion	The article should contain "utilization of big data in policy formulation in Indonesia"
7	Criteria for exclusion	Articles that are incomplete in their entirety, duplicates published in languages other than English, the object of study is not policies in Indonesia, and also articles that do not contain discussions about "the use of big data in policy formulation in Indonesia".

Source: obtained from secondary data

Search Strategy

SLR generally allows synthesizing previous research and the forming of new research paradigms. In this research, terms such as big data, public policy, and Indonesia were searched. The database used in this research uses the Scopus and Google Scholar databases. The use of this database is because research on Big Data in Indonesia is still not dominant, so researchers decided to search more than one database. Implemented search strings (Table 2).

Table 2.

Final search string input

No	Database	Final search string
1	Scopus	TITLE-ABS-KEY (big AND data AND public AND polic* AND indonesia) AND PUBYEAR> 2004 AND PUBYEAR <2025 AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "dp")) AND (LIMIT-TO (SRCTYPE, "j")

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No	Database	Final search string
		OR LIMIT-TO (SRCTYPE, "p"))
2	Google Scholar (via Publish or Perish)	Title words: big data; policy Keywords: big data; public policy; policy; indonesia

Source: obtained from secondary data

Tools

The tools selected and used in this study consist of 4 tools, namely Publish or Perish which is used as an article search engine from the Google Scholar database, Scopus Website as an article search engine from the Scopus database, Covidence is used for filtering and extracting data in conducting systematic review processes, and VOSviewer is used to visualize the results of systematic reviews.

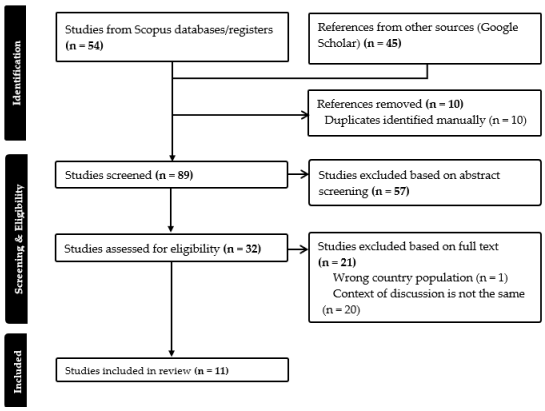
Results and Discussion

Identification of Documents

From the results of document selection conducted through the PRISMA method, a total of 99 papers were found consisting of 54 papers from the Scopus database and 45 papers from the Google Scholar database (Figure 2).

Figure 2.

Document Identification through PRISMA



Source: Covidence

At the identification stage, many forms of papers other than scientific papers were found, which were then screened to produce papers in the form of scientific papers only. Out of 99 papers, 10 duplicate papers were found which were then excluded, so there were 89 papers only that entered the screening stage. From the screening based on title and abstract, 57 papers were excluded for various reasons, such as not in the form of scientific papers, having no full text, and being out of the field. Then, the remaining papers that passed the title and abstract screening stage were screened again based on the full text to see the eligibility of these papers. Of the 32 papers

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screened, 21 papers were excluded because some papers had different contexts of discussion with the use of big data in policy formulation and there were papers that did not have a research locus in Indonesia. Therefore, from the identification process to the screening process, 11 papers were selected that met the criteria which would then be used as material in conducting a systematic review.

Data Processing, Analysis, and Visualizations

Data Preprocessing. When the available content is to be analyzed and visualized, it must first go through preprocessing to make the data more qualified and reliable. Preprocessing is done with scientific standards using the Google Colab program which includes text cleaning, text normalization, hyphenation, and tokenization. In the text cleaning process, content containing punctuation and certain characters are removed. In addition, all content is converted into lowercase letters so that data normalization can be carried out. These steps are done to simplify the tokenization process as it reduces unnecessary word variations. The results of tokenization can then be used for the next stage of data analysis and visualization.

Word Cloud for Data-Driven Public Policy. The results of preprocessing can provide a visual representation in the form of a word cloud regarding which items are most prominent in the analyzed content (figure 3). Still using the Google Colab program with the Python Wordcloud Library, the visualization of the intensity of words that are often used in the content can be seen qualitatively. Figure 3 represents that the root words of big, data, public, policy, indonesia, making, and analysis are included in the words that appear frequently and prominently.

Figure 3.

Word cloud regarding data-driven public policy

Source: Google Colab

Visualization Map of Keyword Networks Regarding Data-Driven Public Policy In creating the network visualization map, we used the VOSviewer program to visualize a two-dimensional map of the keyword link strength of the publications used in this study (figure 4). When two or more keywords are found in the same publication, the link strength will increase. From the map presented in figure 2, it can be seen that the keywords big data, big data analytic/analysis, policy

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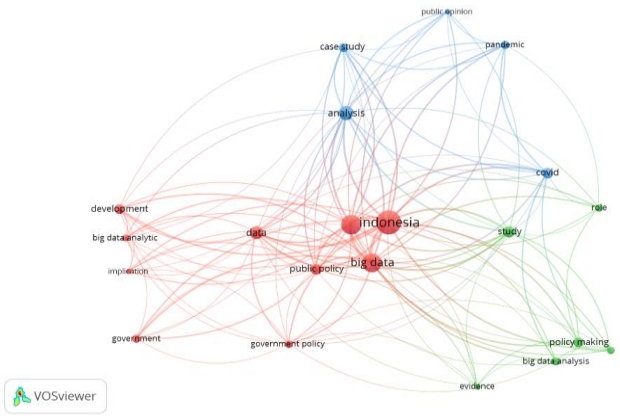
making and public policy are interrelated and have strong ties.

Figure 4.

Keywords network visualization map



Source: VOSviewer

Analytical Results

From the literature reviewed, almost all of them mention that big data analytics can be utilized to improve the overall process of public policy formulation. Its easily accessible and obtainable nature makes big data play a role in making policy designs based on the available information. Furthermore, big data can even play a role in the policy implementation and evaluation process. The following are the results of the analysis of the four dimensions of public policy formulation attached in (Table 3).

Table 3.

Big data analytics in public policy formulation

No	Major Sources	Key Indicator	Sources
1	Planning	The effectiveness of the government in formulating policy plans. With the availability of ready-to-use information, policy formulation will be formulated faster and more accurately. (Hossin et al., 2023).	(Putera et al., 2020), (Gemiharto, 2023), (Rahmanto et al., 2021)
2	Design	An increase in data-driven decision-making efforts and improved performance of the public institution in question (Hossin et al., 2023).	(E. Supriyanto et al., 2021), (Gemiharto, 2023)
3	Delivery	There is an open communication system between the public and the government. Data engagement can increase the effectiveness of public initiatives so that public policies can be informed more effectively (Hossin et al., 2023).	(Anwar et al., 2022), (Gemiharto, 2023)
4	Evaluation	The existence of a monitoring process carried out by the government on public responses, perceptions, and expectations of public policies implemented (Hossin et al., 2023).	(Ariansyah et al., 2024), (Gemiharto, 2023), (Rahmanto et al., 2021)

Source: obtained from secondary data

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Discussion

This section will present an explanation of the findings of the analysis which discusses (1) The decision-making process in the formulation of public policy in Indonesia using big data analysis and (2) How effective and efficient the use of big data in public policy decision-making in Indonesia compared to conventional approaches without big data. Previously, 11 papers or research publications related to the use of big data in public policy decision-making in Indonesia were collected using certain keywords and search engines including Scopus and Google Scholar. The collected papers were then collected into a database for further analysis using the Systematic Literature Review (SLR) method.

Decision Making in Data-Driven Public Policy Making

Big data exists to assist the government in implementing the national one-data policy as outlined in the Republic of Indonesia's Presidential Regulation Number 39 of 2019 about One Data Indonesia (E. Supriyanto et al., 2021). Big data is used by governmeny systems to expedite the execution of government initiatives. A few uses of big data in government include empowering communities, enchancing government initiatives, and boosting stakeholder participation and transparency.

Big data in the government system can be used to develop a variety of policies with different government organizations that are quicker, more accurate, and less expensive. Because government agencies employ big data analytics to transform external data. Big data has more complexity than ordinary data, it can be proven by (1) Involving more technology and more settings of data analysis techniques; (2) The data is very large and distributed in several systems. The complexity will be multiplied if big data is used to find solutions to other complex problems, such as public policymaking (Nasution & Bazin, 2018). By using big data, the government can make public decision-making faster and more effective.

The big data approach can be utilized as a primary tool to demonstrate the effectiveness of a proposed policy. Evidence-based policy, sometimes referred to as evidence in public policy, is derived from the findings of a survey or census of the data required for a policy. Nevertheless, social media users' actions can also provide this data. Big data from social networks, cloud apps, software, social media, warehouse data, equipment, technological networks, legal papers, online business websites, sensor data, and cloud applications can be used by policymakers. (E. E. Supriyanto & Saputra, 2022).

Within the government, the Indonesian government has started implementing big data analysis in several public sectors to enchance data-driven decision-making. With minimum human interaction and the aid of computers that learn from data patterns, the big data

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phenomena, fueled by the internet and increasingly advanced computing systems, will progress more intelligently (E. Supriyanto et al., 2021).

One example of big data's application to decision-making is during the formulation of the COVID-19 policy in Indonesia. The hierarchical and top-down nature of the COVID-19 mitigation policy structure has been demonstrated. For example, without central government clearance, provinces and towns cannot effectively execute PSBB. This data demonstrates that even if local leaders are chosen by their peers, they have limited power to put PSBB into practice inside a hierarchical framework. This runs counter to the big data paradigm, which bases decision-making on information gleaned from vast amounts of data. Since they are more familiar with the local populace, local officials ought to have greater power to enact local regulations (Ramdani et al., 2021).

This case study demonstrates how these choices are a reflection of elite demands. The opinions of civil society organizations and local leaders are typically disregarded by the federal government. The abundance of information on the internet prevents them from integrating the processed data and from providing the kind of insightful insights that one would anticipate from a big data strategy. If governments can obtain insights from massive data warehouses like internet media, there are signs that big data can mediate these hurdles to make decision-making processes more democratic and consensus-oriented

The federal government is not as interested in exploiting big data to mine internet data for information about popular preferences. Decision-makers can recruit and accommodate public preferences from data repositories like internet media in specific scenarios with the aid of big data. The following are some advantages of big data's involvement in government processes: **First**, Government performance has increased as a result of big data's ability to function more efficiently and eliminate the need for traditional tasks. The government may swiftly, simply, precisely, and affordably use the big data collection process to transform information into policies that meet the requirements of the people. **Second**, State revenue will rise as a result of the government system's usage of big data. Big data utilization will lessen the strain on the infrastructure, which will cut down on state spending. Additionally, this will be particularly beneficial for some government sectors, including trade, agriculture, tourism, and export-import, all of which will raise state revenue. **Third**, Big data is being used in the government sector to present data more transparently. This will help the public understand government data more clearly and enable Open Government, which will boost public confidence in the government (E. Supriyanto et al., 2021).

Decision-making in the policy formulation process begins with defining the problem. The

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problem must be defined accurately so as not to jeopardize the effectiveness of the solution taken. This initial step can already involve big data as it can provide invaluable insights when generating information. In addition, big data can also be a tool in the evaluation process by highlighting the evolving trends in society (Gemiharto, 2023).

Effectiveness and Efficiency of Data-Driven Public Policy

In Indonesia, the use of big data in public policy decision-making involves developing a centralized data management policy consisting of data governance, privacy, security and access, as well as formal data related to certain public policy decisions to produce a policy with open data principles. The Indonesian government utilizes big data for more targeted decision-making (Ariansyah et al., 2024). On the other hand, there are still difficulties with big data implementation in Indonesia, pertaining to human resources, supporting infrastructure, data privacy, data standardization, and government factors (Purba et al., 2023; Sirait, 2016).

The Indonesian government has finally come to understand how critical it is to use big data in government, particularly when it comes to decision-making, formulating policies, and monitoring policies. Accurately processed big data presents a great opportunity for the government to assist in formulating appropriate policy decisions. When big data is used as a source of knowledge, backed by technology skills and the willingness of those involved in the policy-making process to generate thoughtful, creative, and proactive solutions to address public issues, public policy becomes meaningful (Putera et al., 2020; Rahmanto et al., 2021).

Big data is crucial for the creation and analysis of public policy. A nation can get the greatest amount of data necessary to regulate its political climate and concentrate heavily on the needs of the general population with effective big data management. Policy analysts will benefit from big data management, which include: (1) making it easier to gather vast and varied data; (2) making it easier to categorize data; and (3) facilitating quick access to data. (Gemiharto, 2023).

Table 4.

Benefits of Big Data in Public Policy Decision Making

No	Benefits
1.	Big data will open access to understanding public behavior from feedback on data generated through government social media reviews.
2.	Big data supports better public management practices
3.	Big data has an impact on the role of public-sector organizations
4.	Big data can provide access to the government to innovate in public policy decision-making

Source: Author's work (2024)

Based on table 4 above is the utilization of big data for the Indonesian government in making public policy decisions so that they can be in accordance with public needs and become more effective and efficient.

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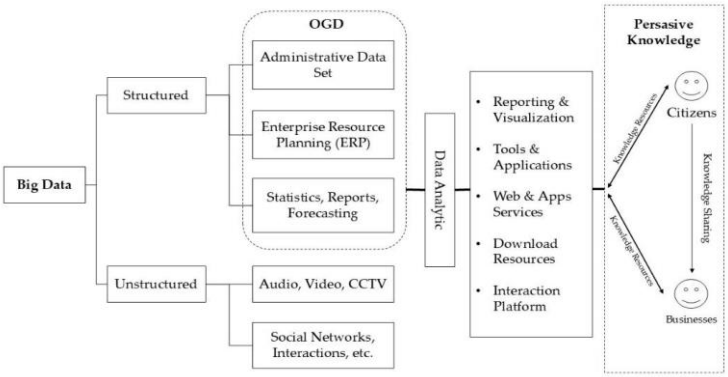
Figure 5.

Big Data and Public Safety



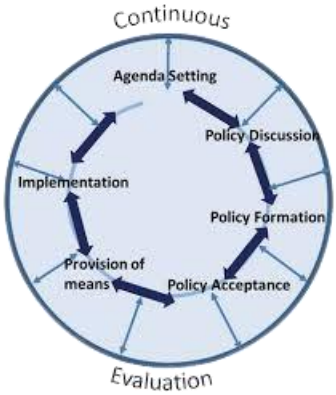
Source: Anshari, et al., (2018) on (Anwar et al., 2022)

Based on figure 5, shows that the data channel sources above are structured data. Media in the form of CCTV, fingerprints, GPS, social media, and others are support for the government in making public policy decisions if there is still unstructured data. The use of data on big data will help the needs of stakeholders including governments, communities, companies, and individuals with more effective and efficient results.

The use of big data can help the government's role in finding effective public policies. This is because the government can predict the orientation of people's interests according to their needs based on the results of big data from reading reviews through articles, journals, reports, and comments on social media. These data will later be analyzed to be used for public policy decision-making needs so that the public policies formulated can be in accordance with the needs of the community (Anwar et al., 2022).

Figure 6.

Policy Cycle That Required Big Data



Source: (Anwar et al., 2022)

Figure 6 above illustrates the policy cycle which consists of six stages of public policy. The first stage begins with setting the agenda for defining problems and drafting public policies. At the

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agenda-setting stage is the selection of problems that will play an important role for decision makers and where the agenda-setting stage will determine which policy priorities must be realized. The challenge in this public policy decision-making process is the data process by the public policy to be formulated. However, the existence of big data is a solution for the government. One of them is that the data on social media platforms can integrate inputs into the policy-making process so that it becomes efficient.

Big data has a combination of information that can be implemented including data management techniques, data management platforms, data storage, data mining preprocessing, security, data integration, data quality, and data governance. The development of big data in various sectors provides an advantage for decision-makers in public policy (Rulinawaty et al., 2024).

Figure 7.

Big Data Process Becomes a Decision

Source: (Rulinawaty et al., 2024)

Figure 3 illustrates the big data process until it produces a decision. In this stage, the role of the government must prioritize a careful planning phase in using big data to make decisions. This is so that the government does not make the mistake of utilizing big data and allocating excess budget. Big data based on Figure 3 above becomes a strength in data processing techniques so that the results (decision) can be right on target.

Figure 8.

How Big Data Analytics Works

Source: (Rulinawaty et al., 2024)

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Figure 8 illustrates that the way big data works above aims to accelerate the implementation of government programs. Big data in the public sector can be used to develop a range of quicker, more accurate, and less expensive policies. In order to produce more structured outputs, the big data work pattern above employs information with an analytical approach.

Big data has played a pivotal role in shifting the paradigm of policymaking from evidence-based to data-driven, hence improving efficacy and efficiency. Compared to earlier methods, data-driven policies enable the storing and retrieval of input, output, productivity, and process data that is more comprehensive and detailed. Big data has improved the process of making decisions by enabling more effective and efficient policymaking, moving away from evidence-based policy and toward data-driven policy (E. E. Supriyanto & Saputra, 2022).

Based on the explanation of the utilization of big data in public policy decision-making in Indonesia, there is one case study at the Indonesian Central Bureau of Statistics (BPS) which produces differences before and after when utilizing big data in it. Before utilizing big data, there was no standard evaluation criteria for utilizing various big data sources to produce statistical data. However, after utilizing big data it, BPS Indonesia can produce a significant change, namely, the establishment of evaluation criteria for data according to BPS needs, and the quality of the data produced becomes higher quality. This is a clear indication that the role of big data can make it more effective and efficient for an agency or government institution in making public policy decisions, including the Indonesian Central Bureau of Statistics.

However, although data-driven public policy is considered effective and efficient, the results of research conducted by (Ariansyah et al., 2024) show that most local governments in Indonesia are at a moderate level regarding the adoption of big data in their government systems. Regions that have good readiness are only in areas on the island of Java. In addition, factors that must be addressed so that the readiness of big data adoption is even better are regarding big data strategies, infrastructure, and human resources, as well as policies and collaboration.

Conclusion

This research aims to provide an overview of the potential and utilization of big data in the public policy cycle. With some limitations of previous research results related to the study in Indonesia, the researcher attempted to adopt existing views to answer the research questions set. Using the SLR, the results of the analysis suggest that big data can be useful in the public sector and the Indonesian government has started to adopt and develop it.

One of the roles of big data in the public sector is the involvement of big data in the public policy cycle in Indonesia, which can produce data-based policies. The policy cycle from

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formulation, and implementation, to evaluation can utilize big data to produce policies that are more relevant and in accordance with community conditions. Especially at the policy formulation stage, big data can provide extensive information and insights for the basis of decision-making. Decision-making in the policy formulation process begins with defining the problem. The problem must be defined correctly and accurately so as not to jeopardize the effectiveness of the solution taken. This initial step can already involve big data because big data can provide invaluable insights when generating information.

In addition, the products resulting from data-driven policy making, namely data-based policy in Indonesia, are considered effective and efficient in addressing problems in the community. Data-driven policies result in the storage and retrieval of more complete and detailed input, output, productivity, and process data compared to previous techniques. Big data has refined the approach to decision-making from evidence-based policy to data-based policy by providing more effective and efficient policymaking.

However, the utilization of big data in Indonesia is still centered on three main sectors, namely telecommunications, banking, and goods manufacturing. In addition, the readiness of big data adoption in government in Indonesia has not yet touched the local government level as a whole. This is due to the lack of several supporting factors such as big data, infrastructure, and human resources, as well as policies and collaboration.

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