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Big Data: What are the Implications for Public Sector Policy in Society 5.0 Era?

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Abstract. Modernization in various sectors of life has made data and information valuable, which has an impact in changing people's lives. One of the changes is how people get information from a large amount of data to be used in the public development sector. Public policy, as a solution to solve various public problems, needs to be supported by accurate data and information facts. With a massive amount of data, this has an impact on public sector organizations to be able to store and analyze various types of information for public policies consideration. The term 'Society 5.0' has emerged, a concept that refers to revolution in people's lives through the use of technology by considering the humanities aspect. The potential for the huge benefits of big data technology is interesting to know as to whether big data can be used for the public policy formulation process. Therefore, this article will provide an overview of the implications of big data for the public policy process in society. This research uses qualitative method with literature study approach. The data came from websites and government documents related to the use of big data in public policies, analyzed using the NVivo12 Plus application. The emergence of big data, as a basis for making public policy, can be utilized for analysis, which includes social data analysis, historical data analysis, and predictive data analysis which can influence accuracy in the policy decision making. Public policy in the era of society 5.0 is vital to be realized through the use of big data as a source of information supported by technology and the readiness of actors in the policy-making process.

1. Introduction

The implementation of big data can be very useful because it can allows us to see the potential and problems that occur so that monitoring and evaluation can be carried out as references for future policy formulation [1]. However, the development of big data is both an opportunity and a challenge for the government in innovation through integrating a public service system to the community [2]. Thus, big data at the national level is vital to form in a one data library system to be able to provide a data platform, data analysis, data services for the public that will increase the source of public knowledge and provide more valuable and quality data availability [3]. Big data is a technology that can process, store, and analyze data in various forms or formats with large amounts and speedy data additions [4].

According to data from the Cisco Global Cloud Index (2015-2020), a city with one million inhabitants will generate 200 gigabytes of data per day by 2020. There are still obstacles related to collaboration between government agencies that have not been running effectively and efficiently. The government currently has minimal open access to be used in development in various sectors, so it has an impact on the consistency and completeness of data among government agencies which often become a public question that will affect the quality of public policy [5]. Google Trends statistical data shows that in Indonesia, throughout 2019, the level of public preference related to big data has only reached 3,383 searches, while access to government data is only 1,506 times. This means that in one month, governance data is only accessed on average 126 times. In the formulation of policies and public development planning in a country, the existence of

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data is an important part. In contrast, at the global level, data is the main thing that continues to be made available by various parties, especially the government [6].

Many research studies on big data in the public sector in Indonesia have been carried out. The existence of a mini big data laboratory has functional feasibility that has reached 80%, but for physical feasibility, it only reaches 65%, and for service quality, it is only 53% [7]. Big data has become a significant resource and can be developed into a strategic data source for financial statement auditors [8]. In their study, it is also revealed that big data has a positive influence on the level of audit effectiveness in government organizations [9].

In the era of big data, data is highly important. Those who are able to process and utilize these large, rapidly-changing, varied and complex data will be able to make big profits. Based on the magnitude of the benefits of big data technology, it is certainly interesting to know what kind of big data can be used for the public policy formulation process. Therefore, this article will provide an overview of the implications of big data for the public policy formulation process in the era of Society 5.0.

2. Method

This research is a qualitative exploratory study with a literature review approach to obtain research data and information. This research design was chosen because it is considered very flexible in digging up information about new topics, which was intended to deepen further research. Exploration here aims to answer the question "What happened in this phenomenon" [10]. Then, the data come from government websites (kominfo.go.id), documents (Indonesia's National Strategy for Artificial Intelligence 2020-2045) and online media (kompas.com, antaranews.com, republika.co.id) related to the use of big data in public policy. In addition, the data were analyzed using NVivo12 Plus, an application software developed for qualitative research to analyze data effectively and efficiently and display the results in tables, graphs, and diagrams [11].

3. Basic Theory

3.1 Artificial Intelligence (AI) and Big Data in the Government Sector

Artificial intelligence (AI) is added into a system. It is a system that is able to read external data correctly, manage the data, and use the processed results for specific purposes [12]. AI is a software or computer software that has a learning mechanism, and then with this knowledge, it is used to make decisions in new situations, like humans do [13]. AI has begun to be used in the community because it can simplify work and increase work productivity [14]. Meanwhile, in the scope of government, AI and big data analysis have begun to be applied in several public sectors by the Indonesian government, as shown in [table 1].

Analytical big data technology and AI, in general, can be applied to the public sector to improve the data-driven decision-making process (Data-Driven Decision). The phenomenon of Big Data, which is supported by the internet and increasingly sophisticated computing systems, will move smarter in line with the help of machines/predictive models learning from data patterns and a minimum of human intervention to increase efficiency and effectiveness [15] [16].

Table 1. The use of Artificial Intelligence (AI) for the public sector in Indonesia

Public Sector	Purpose of Using AI	Utilization of AI
Health	1. Health security dashboard (alert system, access to health facilities, recommended access to medical personnel). 2. Development of a machine learning-based health-tech application to support diagnosis from doctors.	Telemedicine, teleradiology, telesurgery, smart hospital, smart contract, integrated database (BDT) on the national health insurance (JKN).
Bureaucratic Reform	1. Automation of data entry through handwriting recognition. 2. Natural language processing, and question-and-answer technology to provide community services.	Fingerprint, e-service, e-budgeting, e-planning, e-dispo,
Education	1. An open education system that is integrated with educational data, subject matter, question bank, and smart evaluation methods 2. Development of an adaptive assessment system (Adaptive Assessment) and (Intelligent Student Classification)	E-Learning, Intelligence online education, Virtual Laboratory (Vlab), Smart course content with Virtual Reality (VR), Augmented Reality (AR)
Food security	1. Prediction of crop yields and food production 2. For a credit risk assessment system to help farmers get access to loans from financial institutions.	Life Cycle Impact Assessment (LCIA), Agro-Maritime Data, Agro-Maritime Precision, Smart Agro-Maritime
Smart City	1. Intelligent traffic management. 2. Smart waste management. 3. Disaster risk management. 4. Management of citizen information. 5. Management of public facilities.	Electronic Fine (e-Fine), Smart Parking System, GIS (Geo-spatial information System), E-Report, Smart CCTV, Electronic Toll Collection (ETC), Vehicle Data Collection), Transit Signal Priority (TSP),

Source: Indonesia's National Strategy for Artificial Intelligence 2020-2045 [17].

3.2. Big Data for Public Sector Policy

The emergence of big data has provided broad benefits in various sectors, one of which is in public sector organizations that can take advantage of information from big data to maximize public service satisfaction [18]. According to Chrisvania, the benefits of an organization that implements big data are social data analysis, historical data analysis, and predictive analysis [19]. The implementation of data analytics as an essential part of data governance can be done by developing a more comprehensive ICT Governance [20]. Big data-based analysis through various digital means makes data more varied through objective assessments, and it is useful in the accuracy of decision making, which will affect considerations for making improvements to policy planning [21]. Big data technology is widely used in government sector. The use of big data for the public sector is to obtain feedback and responses from the public, which is used as the basis for formulating policies and improving public services. This feedback can be obtained from government service information systems and social media, creating integrated services with specific criteria that make services effective and efficient and to find data-based solutions to problems [22].

The existence of big data supported by the application of AI has provided benefits to help obtain information through data collection so that it becomes the basis for policy decision making and improvement of automation systems in the future [23]. The use of AI has been widely used in various sectors of public life because it can facilitate work and human life, thereby increasing the productivity of work results [14]. For example, in the health sector, AI has been used in knowledge processing to provide initial diagnoses that can be used as a reference source for the public [24]. However, the big data phenomenon as well as the AI have the potential to reduce human nature (humanism), marginalize the weak, powerless, create gaps between netizens and citizens, create new hegemony in the virtual space, and reduce roles in the field of public services [25].

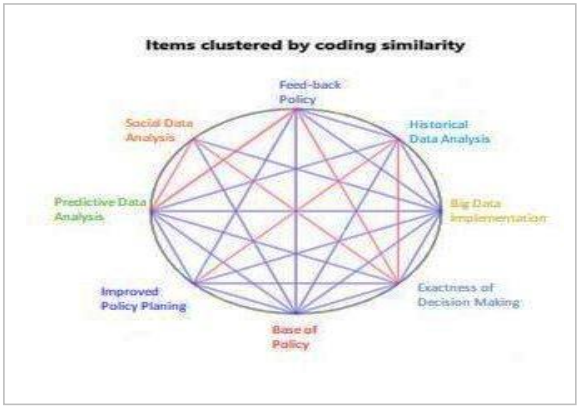
4. Findings and Discussion

4.1. Utilization of Big Data for Public Sector in Indonesia

The world is currently in the digital revolution era where not a second is passed without thousands of data filling the virtual world. The occurrence of extraordinary data expansion results in a large amount of information called big data. With this abundant amount of data, if it can be managed optimally, it will make data a useful tool that can be used to support state development in various sectors. For this reason, the Government of Indonesia has realized that the use of big data in government is crucial, especially for decision making, policy formulation, and as a basis for monitoring and evaluating policies.

The relationship regarding the implementation of big data to public policy can be described as follows.

Figure 1. Big Data in Public Policy



Source: Analysis using NVivo 12 Plus, 2020

Based on Figure 1, the implementation of big data can be used as a basis for making public sector policies through big data analysis, which includes social data analysis, historical data analysis, and predictive data analysis. Taking advantage of historical data analysis that is integrated with social data analysis can influence the accuracy of policy decision making. The increasing number of data and information products generated from big data analysis will enrich policy-making actors with information materials that can be used as consideration and reference before making decisions. Besides, information from the analysis of big data can also serve as material for government studies to make improvements in policy planning that

will be determined later. The availability of ready-to-use information (the results of big data analysis) will undoubtedly make the government more efficient in the preparation of policy plans so that the stages of policy formulation can be carried out quickly and the results are more accurate because policies are formulated based on the accuracy of the results of big data analysis. Big data analysis can provide insight into the success of predictive analytics and improve data-based decision making that will improve the performance of public institutions [26]. Several opportunities for using Big Data in the public sector include getting feedback and public response from government service information systems and social media, as a basis for policy-making and improving public services and finding solutions to predictable problems based on data. In short, the renewal of information and communication technology (ICT) has created a new style for the public, which is the ability to access data and information quickly and also expects the government to respond to issues accurately and promptly, by starting to emerge the need for a transparent relationship pattern between government and society. At the same time, the government is asked to be able to provide valid policies based on real-time data so that they can answer the demands of situations that are of public need. This trend shows that the use of data and information is necessary to improve the quality of public policies and increase Indonesia's competitiveness. Accurate analysis of big data will produce information that can be used in public policy making [27].

Big data analysis can encourage the availability of new information more quickly and more frequently (high frequency) and can be used quickly to respond to data gap issues that are often faced in policy formulation. The government will find it easier to monitor public expectations and perceptions of public policies more accurately to increase the quick response to policies that are about to be, are being, or have already been implemented, such as Bandung City Government with Bandung Command Center based on social media [table 2]. The ability to analyze and utilize big data on social media can be considered in determining attitudes and policies. Data that is processed into information through big data analysis is used to support the policy formulation process. Big data combined with proper analysis will produce information that can be used to make policies, so that knowledge transformation will occur, which will later affect people's lives [21].

4.2. Public Policy in Society 5.0 Era

Society 5.0 is significant to be realized through research and scientific development supported by technology and human resource competencies to contribute to various public sectors [28]. Public policy in the era of society 5.0 is vital to be realized through the use of big data as a source of information and knowledge development supported by technology and the readiness of actors involved in the policy-making process. The policy-makers in the era of Society 5.0 should not only possess high knowledge of technology, but must also be balanced with moral and ethical behavior. Changes are needed in the stages of formulating responsive and aspirational public policies in response to any form of information in the form of public demands coming from various sources. Big data in the era of society becomes one part of the work foundation for creating anticipatory, reflective, and innovative public policies in solving public problems and having the right orientation to face other challenges in the future. With the combination of big data analysis technology and artificial intelligence, it can provide detailed and legal data that can improve the data-based decision-making process [29].

This research provides an essential meaning in the use of big data in the public sector that can be used by the government to produce policies based on public responses, not based on the interests of certain groups. With big data, the resulting policies will be objective, and through this research it is hoped that in the future big data will be increasingly glimpsed by government stakeholders in Indonesia, both central and regional, to become one of the benchmarks for the successful

implementation of public policies. The potential of big data that is processed accurately can be utilized as an excellent opportunity for the government to assist in making appropriate policy decisions. Seeing this, the government must realize that the use of big data in government is crucial, especially for decision making, policy formulation, and as one of the foundations for policy-making. Public policy is significant to be realized through the use of big data as a source of information supported by technological capabilities and the readiness of actors in the policy-making process to produce anticipatory, reflective, and innovative solutions in solving public problems.

5. Conclusion

Big data implementation becomes the basis in public policy formulation through big data analysis, including social data analysis, historical data analysis, and predictive data analysis. Public policy in the Society 5.0 era is vital to be realized through the use of big data as a source of information supported by technology and the readiness of actors in the policy-making process. With big data, public policy becomes more accurate because the policy is produced by the government based on data. Big data possesses significant impact in the policy-making process to produce anticipatory, reflective, and innovative solutions in solving public problems.

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