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UNLEASHING THE POWER OF BIG DATA: THE PHENOMENON BEHIND INDONESIA'S SMART CITY POLICY IMPLEMENTATION

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ABSTRACT

The concept of smart cities has emerged as a promising prospect for several major urban centers in Indonesia. Putting smart city projects together requires thinking about many things. Big data has become one of the most important parts for making sure that these projects will last. Employing big data technology makes it easier to improve the ways that data is stored and processed. This makes it possible to gather useful data that could greatly improve a wide range of smart city services. This study uses a library-based qualitative research approach to analyze scholarly journals and relevant literature. The method involves meticulous collection of data from carefully chosen libraries, aiming to provide comprehensive insights into the phenomenon of big data in smart cities implementation within government administration. This study aims to contribute to the identification and analysis of challenges encountered in emergency situations, with the ultimate goal of providing assistance in effectively mapping the problem at hand. The present discourse underscores the indispensability of Indonesia's contemporary human mindset in bolstering the viability of the smart city paradigm.

Keywords: *big data, government policy, smart city, governance*

INTRODUCTION

The exponential progress of technology and the proliferation of information have profoundly reshaped the fabric of human existence, encompassing social dynamics, cultural practices, and the dissemination of knowledge. Furthermore, these developments have exerted a transformative influence on communal lifestyles. Simultaneously, the burgeoning populace within urban communities persists in its upward trajectory, thereby engendering a concomitant escalation in the requisites of said communities, as a means to effectively confront and redress extant transformations. The dynamic nature of contemporary society has engendered a multitude of responses from various stakeholders, prompting them

to adapt and align themselves with prevailing transformations. Notably, the government has emerged as a key participant in this process, actively engaging with and responding to the evolving landscape.

In light of this phenomenon, governmental entities have initiated significant advancements by implementing the smart city paradigm within their administrative domains, including both local and municipal governments. The present form of governance under consideration has been devised as a response to the imperative of accommodating contemporary technological progress (Löfgren & Webster, 2020). The urban locale that self-identifies as a smart city encompasses various domains of intelligence, including but not limited to transportation, agriculture, energy, and governance. The emergence of the Smart City paradigm can be attributed to the transformative forces that shape urban environments. This conceptual framework represents a concerted endeavor to enhance urban functionality and societal well-being, while concurrently mitigating resource consumption and financial burdens.

A key objective of the Smart City concept is to foster the widespread adoption of digital technologies, thereby empowering individuals to engage with these tools in a proficient and proactive manner (Lopes, 2017). The emergence of the smart city paradigm can be attributed to the ongoing trend of rural-to-urban migration, wherein a growing number of individuals are relocating from rural areas to urban centers. The aforementioned statement posits that there exists an impetus for the denizens of the urban locale, urban planners, entrepreneurs, and governmental entities to collectively foster a novel paradigm in the realm of urban existence (Rathore et al., 2016; Syahbudin, 2016). In order to substantiate this claim, it is imperative to possess an uninterrupted internet connectivity that remains consistently linked to network technologies encompassing objects and devices possessed by each municipal community.

The Republic of Indonesia, which has a total of 514 districts and cities, has not fully embraced the smart city paradigm throughout its diverse territory. It should be noted that only major cities such as Jakarta, Bandung, and Surabaya have taken steps forward in implementing this concept. However, it is vital to

acknowledge that these efforts are not flawless, so corrective measures need to be taken. O'Reilly Media, a well-known publishing company specializing in technology literature and computer science, first introduced the idea of big data in 2005. The use of big data technology can be applied in a wide range of sectors, from corporations, small and medium-sized enterprises (SMEs), to government entities.

In light of the advent of the big data era, the recognition of data as a pivotal strategic asset is growing progressively conspicuous. The utilization of big data in the context of smart cities plays a pivotal role in furnishing governments with the requisite information to formulate strategic policies aimed at enhancing the efficacy and precision of public services rendered to their populace (Hashem et al., 2016). The utilization of big data analysis in the formulation of policies within urban settings has become increasingly prevalent. In addition to its role in policy development, governments have also recognized the potential of big data as a means to gauge the efficacy and triumph of their implemented policies. In the study conducted by Sirait (2016), the author investigated a particular phenomenon or topic. The research aimed to explore and analyze various aspects The potential for exploitation arises from the susceptibility of government information systems and social media accounts, which can be utilized as conduits for monitoring citizen reactions to implemented policies within a given municipality.

The utilization of big data has emerged as a pivotal factor in facilitating the execution of governmental functions and the fulfillment of obligations towards communities. E-government, smart cities, and open government initiatives have witnessed remarkable efficacy owing to the adept handling and utilization of big data by governing bodies (Hardy & Maurushat, 2017; Löfgren & Webster, 2020). The exponential growth of data generation in recent years has resulted in a significant increase, amounting to approximately 80% (eighty percent), in the overall volume of data available worldwide. The advent of smartphones, computers, laptops, and various other technological devices has facilitated the monitoring and dissemination of a wide range of personal information. These advancements have empowered individuals to track and exchange data pertaining

to their geographical positioning, physical well-being, financial status, physical fitness, and energy usage. The prominent influence of social media trends within the community has emerged as a significant driver of big data accumulation. Consequently, governmental entities are urged to seize this opportunity to optimize the integration of e-government initiatives or smart city frameworks within meticulously planned urban areas.

Big Data not only encompasses the accumulation of vast quantities of data, but it also serves as a means to obtain comprehensive insights and solutions across various domains. The present discourse underscores the imperative for Indonesian cities that have embraced the notion of a gateway city to conscientiously deliberate upon the voluminous corpus of big data available within their purview. By doing so, these urban centers can ensure that their decision-making processes and public policy formulations are imbued with heightened efficacy. The present discourse is motivated by the author's inclination to delve into an extensive examination of the intricate interplay between the burgeoning big data phenomenon and the multifaceted process of smart city implementation.

METHOD

The present study adopts a qualitative research approach, specifically employing a library-based methodology. The primary focus of this investigation revolves around the analysis of scholarly journals and other relevant literature sources. The present study employs a qualitative research approach, which entails the generation of information through the examination and analysis of textual records and descriptive data. The present study employs a methodological approach that involves the collection of research data from carefully chosen libraries. These libraries have been meticulously selected, thoroughly searched, thoughtfully presented, and meticulously analyzed. The purpose of this methodological approach is to derive comprehensive insights and draw conclusive findings pertaining to the phenomenon of big data in the context of implementing smart cities within the realm of government administration.

RESULT AND DISCUSSION

The notion of smart cities has emerged as a promising prospect for several major urban centers in Indonesia. The notion under consideration is perceived as a potential resolution for addressing issues related to traffic congestion, the proliferation of waste in disarray, or the surveillance of environmental parameters within a specific location (Pereira et al., 2018; Tomor et al., 2019). The present urban landscape is witnessing the emergence of a novel paradigm known as the "smart city." This transformative concept is underpinned by a multifaceted framework comprising various pillars, namely smart governance, smart people, smart living, smart mobility, smart economy, and smart environment. These pillars collectively serve as the foundational elements that shape and define the overarching structure of a smart city. Through the integration of governmental organization, citizen participation and the use of advanced technologies and data-driven approaches, smart governance ensures efficient and effective decision-making processes, fostering a more responsive and inclusive urban administration.

The pillar of smart people emphasizes the empowerment of citizens through digital literacy and engagement, enabling active participation in the city's affairs. The pillar of smart people emphasizes the empowerment of citizens through digital literacy and engagement, enabling active participation in the city's affairs. According to Nuzir & Saifuddi (2015) the parameters associated with smart cities can be categorized into two dimensions: intellectual quotient (IQ) and emotional quotient (EQ), and all of this has led to smart people. The researchers changed it to include the infrastructure quotient in the circle of smart people living, which is an important factor in building smart cities, as well as the environmental quotient, which is a key part of adaptation right now, especially when it comes to stopping environmental degradation.

Smart living encompasses the deployment of intelligent infrastructure and services that enhance the quality of life for residents, promoting sustainability and well-being. Smart living goes beyond the conventional approach to urban development, leveraging cutting-edge technologies to create connected

ecosystems that seamlessly integrate with residents' daily lives. By harnessing the power of data analytics and the Internet of Things (IoT), smart living initiatives aim to optimize resource utilization, reduce environmental impact, and streamline the delivery of essential services. The deployment of intelligent infrastructure, such as smart grids, waste management systems, and energy-efficient buildings, contributes to a more sustainable and eco-friendlier urban environment. Residents benefit from real-time information and automation, enjoying enhanced convenience through features like smart home devices, responsive public transportation, and intelligent public spaces. Furthermore, the emphasis on well-being extends to healthcare innovations, with telemedicine and health monitoring systems fostering preventive care and empowering individuals to take charge of their health. As smart living continues to evolve, the focus remains on creating inclusive, accessible, and resilient communities that prioritize the holistic needs of residents, fostering a harmonious balance between technology and the enhancement of the overall quality of life.

Smart mobility focuses on the optimization of transportation systems, leveraging cutting-edge technologies to facilitate seamless and sustainable movement within the city. Similar to Li et al., (2015), who emphasized the importance of big data as a crucial element in collecting data for the implementation of smart mobility, this study investigates how the London Public Transit System, a notable public transportation service that operates in the United Kingdom, the use of a smart card called the Oyster, which records almost eight million journeys made by trains and buses, has gained significant attention in this system. The system has the capacity to handle a large amount of data, specifically one billion records related to individuals using the public transit network. Gathering data on passenger preferences and choices is highly important for public transport authorities. Gaining insight into the fundamental reasons for passenger choices during specific time periods, especially when there is a higher number of passengers, allows authorities to develop more effective policies and initiatives to meet the demands of their customers. This strategy can be executed

in prominent urban areas in Indonesia that have formally declared themselves as smart cities.

The pillar of a smart economy revolves around the cultivation of smart city initiatives that not only confer convenience and advantages upon governmental entities but also prove beneficial to the populace inhabiting the urban landscape. The governments of Jakarta, Surabaya, Bandung, and other prominent urban centers have initiated and commenced the process of implementing the smart city concept. Fortifying the smart city paradigm facilitates the trajectory towards actualizing a smart economy, enabling denizens of smart cities to transition seamlessly into a digital economic framework (Ajie Bahari et al., 2021; Tyas et al., 2019).

The integration of smart city initiatives necessitates the consideration of various factors, among which big data has emerged as a crucial element in ensuring the sustainability of these endeavors. The advent of big data in Indonesia commenced in 2013, marking a significant milestone in the country's technological landscape. Notably, the private sector has emerged as the primary adopter of this transformative technology, leveraging its potential for growth and development. Conversely, the government sector has exhibited a relatively limited utilization of big data thus far. The utilization of big data technology facilitates the optimization of data storage and processing mechanisms, thereby enabling the generation of valuable information that has the potential to significantly enhance an extensive array of smart city services.

The application of big data has become a helpful instrument for decision-makers in planning the expansion of smart city services and the distribution of resources. Big data is used in market analysis to analyze public service satisfaction answers expressed by citizens through verbal communication on social media platforms. Researchers thoroughly study and analyze this data, which they obtain through the use of hashtags and other data gathering techniques. The findings bear a strong resemblance to the research conducted by Bhairawa Putera

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et al., (2020), in which the Indonesian government utilized the Indonesia One Data platform to establish future policies and provide instructions for collecting data from individuals in regional and central government. This allows the government to analyze public service satisfaction and policy effectiveness from the community's perspective, ensuring that policy and public services are aligned with community needs.

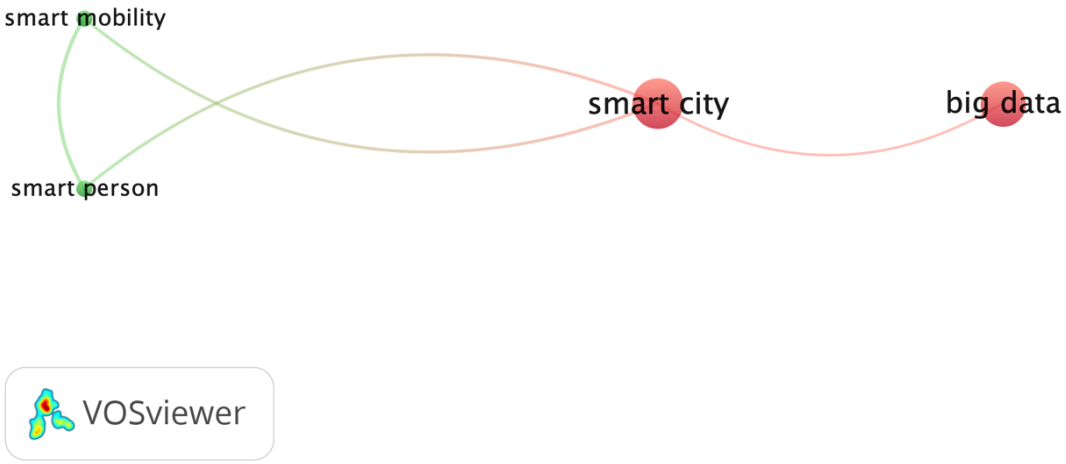

Figure 1. How library research reveals a snowball effect of big data on smart cities administration

The above illustration shows the relationship between big data and city administration at a time when digitization is growing. It does this by showing how big data affects smart city administration and the snowball effect that follows. The results emphasize the profound capacity of big data to improve the effectiveness, precision, and all-encompassing nature of municipal management systems. However, they also draw attention to the obstacles and ethical implications that emerge in this process. As is the case with the pervasive data collection mechanisms, facilitated by sensors and cameras, raise significant concerns about intrusive surveillance and the potential compromise of individual privacy. Despite

attempts at anonymization, the aggregation of diverse datasets may still pose risks of re-identification.

The susceptibility of smart city systems to cyberattacks presents significant data security risks, encompassing potential outcomes such as identity theft and the manipulation of vital information. Furthermore, algorithmic bias continues to be a significant concern, since the algorithms that support decision-making in smart cities may unintentionally reinforce existing social biases, leading to discriminatory results and a lack of clarity in the decision-making process. Acquiring informed permission poses difficulties with individual rights, and citizens have restricted authority over their data after it is gathered.

The issue is additionally complicated by the social equity aspect, given that inequitable access to technology and digital literacy can exacerbate pre-existing inequalities. The ambiguity surrounding data ownership gives rise to concerns regarding ownership and accountability, which subsequently give rise to disputes and prompt inquiries regarding responsibility in instances of data misuse. Furthermore, it is imperative to contemplate the enduring consequences of relying on big data systems, such as the potential for vendor lock-in. In conclusion, the ethical quandaries that arise from the infrastructure sustaining these technologies, particularly the heightened energy consumption, necessitate sustainable resolutions. When considering the incorporation of big data into smart city frameworks, it is critical to adopt a comprehensive approach that requires cooperation from policymakers, technologists, and citizens. This ensures that the advantages of big data integration are consistent with the safeguarding of fundamental rights and ethical principles.

Big data is data that has large volumes, so it cannot be processed using ordinary traditional tools and must use new ways and tools to get value from this data. For example, the concept of big data in a mobile-based smart city app by the Bogor government sets out the concept against all complaints and complaints made by citizens. The input data is then processed. The results of the analysis of

the complaints are then managed, and the government stakeholders can present them in an easy-to-understand form that can then be used as a reference to determine future government policy. The role of big data is very helpful in that case.

In revisiting the events that transpired in Bogor, it is noteworthy to highlight the establishment of the Bogor Green Room (BGR). In collaboration with the prestigious Institute of Technology Bandung (ITB) and Telkom Group, the government of Bogor City led this initiative. The primary objective of the BGR is to serve as a comprehensive data and information hub, facilitating informed decision-making pertaining to population dynamics, environmental concerns, and the overall well-being of the city's inhabitants. It is necessary to use technology to improve public services, especially when it comes to keeping an eye on the condition of transportation, managing emergency responses, and getting natural disaster warnings out to people.

The successful implementation of a smart city that uses big data technology depends on everyone in society and the government using it to its fullest and getting involved. However, it is important to acknowledge that there may be certain challenges that could potentially occur, such as: 1) Instances of breaches of privacy; The protection of individual rights to privacy is of paramount importance, particularly in cases involving secret and private complaints. It is crucial to safeguard these rights by ensuring that the identity of individuals remains undisclosed in general. Due to the open nature of the program, all users have the ability to directly see the source and complaint documents. 2) Analyzing incongruous facts; The supplied documents or data pertaining to complaints may lack appropriateness and necessitate a more comprehensive review. Hence, it is anticipated that individuals from the general public who submit complaints will be able to furnish substantiated data and credible sources. 3) Challenges in data analysis; The main goal of the big data analysis built into this system is supposed to be to give feedback or take action in response to complaints about public

services. However, it is possible for errors to occur throughout the analysis process due to the presence of previously uploaded or inaccurate data sources.

The concept of smart cities using big data technology will work well if governments and communities can play an active role between them. However, there are some problems that will arise in the implementation of the concept; among them is a breach of the privacy of the users. If the data is gathered on a single platform that is open to anyone, then anyone who uses this application can see the source and the complaint documents directly. Then, there is a matter of invalid data filling carried out by the public, so the analysis of big data on this system should be expected to be feedback or a response to public service complaints, but there may be errors at the time of the analysis due to the previously uploaded data source being incorrect or invalid.

Next to the municipality of Bandung, the utilization of big data technology in the establishment of the Digital Command Center in 2015 has played a pivotal role in facilitating the realization of smart cities in Bandung, alongside the efforts of the local government. The Regional Disposal Organization and the various districts in the city jointly own the facility, which houses a wide range of accessible applications. The presented application showcases the performance reports of the corresponding agencies, shedding light on the transparency of the procurement process pertaining to the acquisition of goods and services. In addition, closed-circuit television (CCTV) systems have been set up in a number of places to make it easier to keep an eye on and handle a wide range of situations, such as traffic jams and fires. In another example, the municipality of Bandung has launched the Panic Button application, which is the first aid in emergency conditions for the citizens of Bandung. Fire management SOP or demonstration security SOP, as well as GPS tracking of service vehicles like fire cars and ambulances, is a notification system integrated with the Digital Command Center.

Among these applications, social media analytics stands out as the most prominent data technology among the aforementioned uses. Social media

analytics provides statistics pertaining to the current popular subject matter concerning the urban area of Bandung, which have been sourced from various social media platforms. Popular social media platforms such as Facebook and Twitter. This service aims to assist the government of Bandung in identifying the prevailing subject of discussion within the local community of Bandung. This study aims to contribute to the identification and analysis of challenges encountered in emergency situations, with the ultimate goal of providing assistance in effectively mapping the problem at hand. Therefore, governments have the ability to assess their programs and policies by considering public feedback, which in turn aids in the process of decision-making.

We turn to the city of Makassar, In the urban landscape of Makassar, the local government has implemented a comprehensive surveillance system to effectively monitor and address the issue of traffic congestion. This initiative involves the strategic placement of closed-circuit television (CCTV) cameras throughout key areas within the city that are prone to experiencing traffic jams. By leveraging this technological infrastructure, the government of Makassar City aims to enhance their ability to detect and manage traffic congestion in a timely and efficient manner. The current status of the online parking payment system indicates that it is progressing as planned. In addition, it is noteworthy to mention that the city of Makassar has already implemented a sophisticated electronic payment system known as the Makassar Smart Card. This multifunctional card serves as a means to facilitate various governmental and financial transactions within the city. The acquisition and categorization of population data by the government can be facilitated through the utilization of the Makassar Smart Card. The utilization of smart cards enables the government to effectively monitor the degree to which the demands of individuals are fulfilled, the frequency of their financial transactions, and the specific expenditures made by citizens during a given period. Additionally, smart cards provide valuable insights into the timing preferences of individuals when engaging in administrative and government-related activities.

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CONCLUSION

The present exhibition explores the intriguing notion of a smart city. The integration of smart technology within urban environments has the potential to significantly enhance the ease and efficiency of everyday human activities. The significance of data in the context of smart city sustainability, particularly in the realm of "Big Data," cannot be overstated. The contemporary abundance and affordability of extensive datasets ought to serve as a catalyst for diverse stakeholders. Specifically, governmental entities are urged to exhibit astuteness in harnessing this resource by embracing the practice of big data analysis. Utilizing empirical evidence, the formulation and execution of public policies can be enhanced in terms of efficacy and alignment with the desired objectives of the populace.

The present discourse aims to elucidate the indispensability of Indonesia's contemporary human mindset in bolstering the viability of the smart city paradigm. The imperative for urban societies to prioritize environmental consciousness, optimize technological utilization, and embrace intelligent lifestyles has become increasingly apparent. The inquiry arises as to whether a city in Indonesia, purportedly possessing smart city infrastructure, continues to engage in the disposal of waste, destruction or removal of facilities, and other detrimental activities. The present inquiry pertains to the potential misinterpretation of existing data by local governmental bodies or the suboptimal assimilation of big data technology. The current implementation of smart cities deviates from the fundamental principles and fails to effectively address the challenges faced by urban communities. Hence, it becomes imperative to duly acknowledge and harness the potential of big data within the context of smart cities for the purpose of urban development planning.

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