

Analysis of the Influence of Technology in Creating a Smart City: Systematic Literature Review

Widian Nigrum*, Elfritri Oktavia, Nurhasan Syah, Heldi, Indra Catri

Master Program of Environmental Science, Postgraduate School – Universitas Negeri Padang, Indonesia

*E-mail: widiann@gmail.com

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ABSTRACT

The concept of Smart City is a concept that has gone through the refinements of the ideas that have previously developed by patching existing shortcomings and considering aspects that may not yet exist in the concepts based on Information and Communication Technology (ICT) that have appeared before. The role of technology in the Smart City has two sides that must be noted, in addition to providing many great opportunities, it can also cause vulnerability if the technology is misused or applied in a dangerous or deviant manner and without adequate provisions. This type of research is research that uses the systematic review method (Systematic Review). The stages of literature collection refer to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. The results of this research show that digital technology can be applied to build a smarter city that responds to the needs of the community. Innovation and digital technology can change, replace, or complement existing standards in certain companies, ecosystems, and sectors. Digital transformation is the most important part of the Smart City concept because it can improve efficiency, quality of life, and various aspects of urban life. In addition, technology and digital play an important role in changing the urban landscape in digital transformation.

KeyWords: *Influence of Technology, Smart City, Systematic Literature Review.*



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INTRODUCTION

The Smart City concept currently continues to develop following the development of the times, from the beginning it was only a concept in the form of pictures or plans, but at this time it has developed and has been shown with the existence of a Smart City, this can happen because of the progress of the information system which is complex (Anthopoulos & Fitsilis, 2010). To turn a city into a Smart City several things must be observed, such as human resources, technology, and institutions (Taewoo & Theresa, 2011).

Smart City is not a thing or technology, but a process that combines various elements into one in a creative way (Kurniawan & Andiyan, 2021). Smart City is defined as the use of smart computing technology to integrate important components of city infrastructure and services, such as city administration, education, health, public safety, real estate, transportation, and other city needs, where the overall use must be done intelligently, mutually related, and efficient (Washburn et al., 2010). According to Giffinger et al (2007), a Smart City is a city that is at the forefront of the economy, human resources, government, mobility, environment, and community life, which is built intelligently, independently, and has awareness from its community.

Smart City, which is the development of increasingly smart technology, makes the smart concept not only applied to various devices but to various systems or arrangements. The concept called a Smart City is a concept that highlights a Smart City order that can play a role in making it easier for the community to get information quickly and accurately. The Smart City concept is presented as an answer for efficient resource management. Arguably, this Smart City concept is the direct integration of information with the urban community (Hasibuan & Sulaiman, 2019).

Increasing urbanization creates new problems for urban areas. Starting from garbage, education, transportation, social economy, disaster, and health. On the other hand, the society that is becoming more modern and stable has a myriad of expectations, such as a comfortable living and working environment, the existence of adequate public areas, as well as the ease of managing all forms of public services. For that reason, the concept of a Smart City became a hot discussion and continued to be echoed in various cities in the world including Indonesia (Suhendra, 2017). In Indonesia, the concept of a Smart City is now starting to be applied in various big cities. This concept is a dream for cities in Indonesia because it is believed to be able to solve various urban problems such as congestion, garbage accumulation, and the safety of city residents. The Smart City concept highlights a city order that facilitates the community (Suhartono & Sina, 2020).

The development of the concept of Smart City gives rise to an understanding of the concept of Smart City which is diverse and not yet clear or consistent. Cities that are called Smart City initially have breakthroughs in solving problems in their cities, which then succeed in improving their city's performance (Izzuddin, 2022). The development of cities towards Smart City begins with the use of information and communication technology which is usually partial, to priority problems (Amri, 2016). For example in Indonesia, several large cities such as Jakarta, Bandung, Surabaya, Yogyakarta, and Malang have significant population growth problems, congestion, garbage accumulation, and other population problems that require accurate problem-solving. Thanks to the touch of technology, some big cities are beginning to lead to the application of the Smart City concept, namely with the birth of e-government, e-procurement, e-budgeting, e-delivery, e-controlling, and e-monitoring (Susanto et al., 2018).

An outline can be taken from interpreting the Smart City Concept as a concept that has gone through the refinements of concepts that have previously developed by patching existing shortcomings and considering aspects that may not yet exist in concepts based on ICT that have appeared before. This concept ultimately not only bases the development and management of the city in the technological dimension but also includes the human dimension and the institutional dimension (Gunawan & Lynawati, 2018).

Seven key elements are vital aspects in creating a Smart City, among others 1) Meeting the needs of society and business (education, health, housing, infrastructure, digital equality); 2) sustainability/economic turnover; 3) offering employment and competitiveness; 4) community support in Smart City planning (intelligent data analysis, broad community involvement); 5) improve infrastructure and resources; 6) providing technology and AI; and 7) provide better security (protection from cyber-attacks and

natural disasters) (Saputro & Darminto, 2019). The role of technology in the Smart City has two sides that should be noted, besides being able to provide many great opportunities but also causes vulnerability if the technology is misused or applied in a dangerous or deviant way and without adequate backup emergency provisions (Josept et al., 2019). Ensuring the success of technology adoption in the application of Smart City is an important part of success in addition to financial factors, government policy, resource readiness, and infrastructure (Azhari & Sutabri, 2024). The biggest influence on the creation of a Smart City is the existence of Smart technology, therefore researchers are interested in analyzing the influence of technology in creating a Smart City.

METHODS

The type of research used in this research is a Systematic Review. Kitchenham (2004); Aryantie et al (2023); Putra et al (2023) states that a systematic review is a method used by researchers to identify, evaluate, and interpret relevant research results that become the focus of the research. A systematic review is done by understanding the content of the article in a structured way. The literature search was carried out in May 2024. The data sources used to search for literature are Pubmed.gov, Scopus, and Google Scholar. In addition, reference articles are searched using an application in the form of Publish or Parish which can make it easier for researchers to find a reference article that is needed. The article data searched and synthesized is an article with a publication history from 2019-2023. To search for literature articles, keywords related to the influence of technology and Smart City without language limitations are used. In this research, four inclusion criteria were used, namely, the research was conducted on the influence of technology and Smart City, the article must be written in Indonesian or English, and must be an original research article (not a review article), with a period of the last 5 years.

The stage of literature collection refers to the Preferred Reporting Item for Systematic Review (PRISMA) guide. Four stages serve as a reference in this research, the first in the form of article identification, article criteria, article eligibility, and article screening. In the article identification stage, a search for the source of the article to be used is carried out (article searching). In the second stage, which is the screening of articles, at this stage, the articles that have been published are screened and their eligibility is seen in the form of titles and abstracts of the articles that have been searched. Further, in the article acceptance stage, the selection of articles that will be used for qualitative and quantitative data in this research is confirmed. Then acceptance is done to read the entire content of the selected article (Liberati et al., 2009). The data obtained from the selected articles were then synthesized and did not use meta-analysis or qualitative data synthesis (Synthesis Without Meta-analysis, SWiM). Qualitative synthesis is used to collect data from research articles that have been obtained and then the data is narrated descriptively. This was done to explain the results of research on the role of the local wisdom of the Mentawai tribe community on mitigation (Campbell et al., 2020)

RESULTS

Article search in the database produced 3000 articles. Furthermore, due to irrelevant titles, and duplicated article titles, 2749 articles were removed, resulting in 251 articles. Then, identification of the abstract is carried out, whether it is by the questions and research objectives of the systematic literature review, as well as the determination of the articles used must meet the criteria that have been set and be eligible to be used and synthesized qualitatively and quantitatively. So only 5 articles can be found that can be used in a systematic review. The stages and process of article selection can be seen in Figure 1 below.

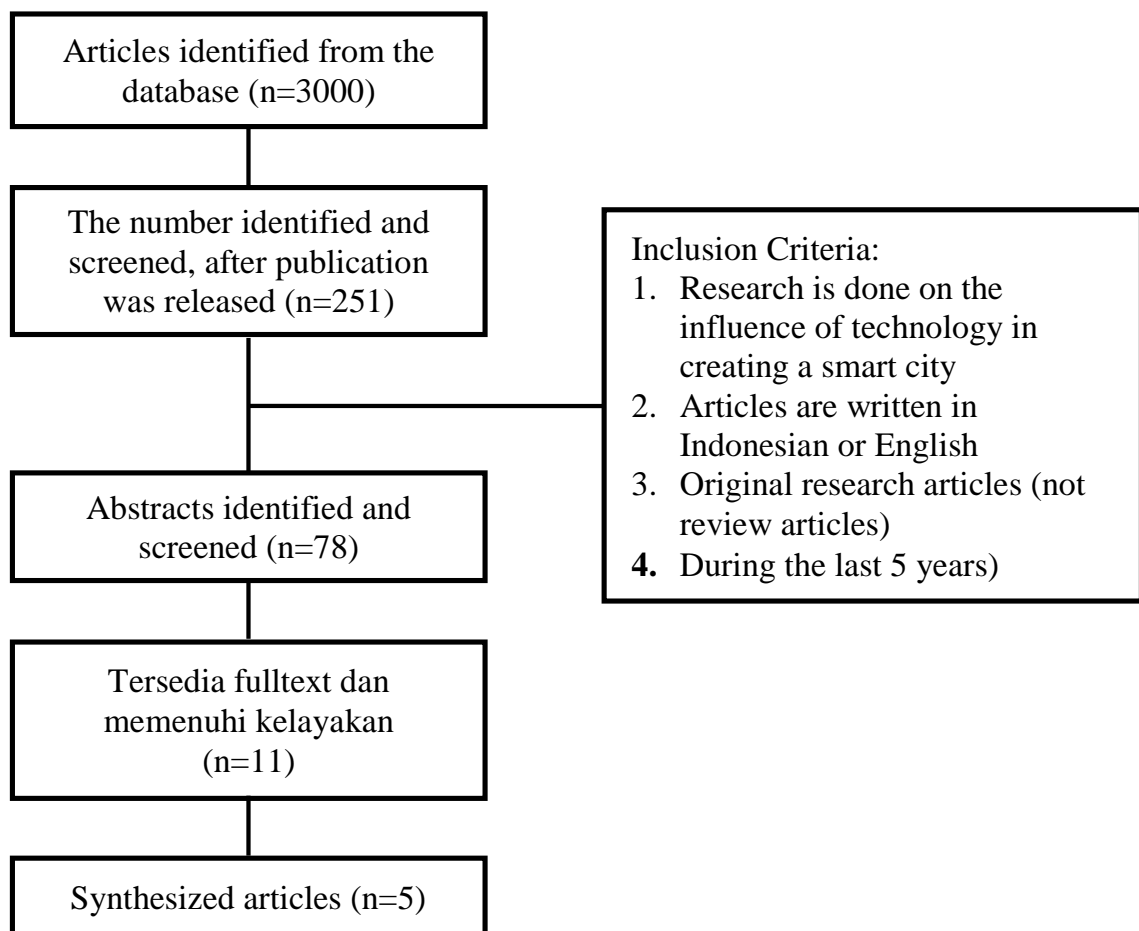


Figure 1. Article selection process.

The five studies that are seen to be systematically eligible are in the form of research that uses qualitative and descriptive methods, although the study titled Disruption of Technology in the Concept of Smart Society with the Construction of the Society 5.0 Concept uses a literature review plan using a qualitative approach, the researcher still includes it in the article that will be synthesized. This is because, based on the method used in the research, there is a search for data that discusses technology in the development of Smart City, a summary of the data from the research can be seen in Table 1 below.

Table 1. Summary description of data from included studies

Title	Author/Year	Method	Results
The Effect of Implementing E-Government on Development Smart City in Sumenep Regency	(Alfiyah, 2019)	The research was carried out using an explanatory descriptive method, where descriptive is a method of researching a condition, an object, and an event occurring in the present.	Based on the research results, the implementation of e-government that occurred in Sumenep Regency through g-online became a pioneer in the birth of integrated government using electronic-based systems. This is then continued with the development of Smart City in response to the rapid development of e-government in the region. Foundations of development Smart City This cannot be separated from the functions and provisions that exist in e-government. So it can be said that the development of a smart city in Sumenep Regency cannot be separated from the influence of implementing e-government in regional government.
Jakarta Policy Implementation Smart City in Realizing Smart Governance in the DKI Jakarta Provincial Government	(Rahmadani & Handoyo, 2022)	This study is qualitative research. The research setting was carried out in the Jakarta Management Unit Smart City which is located in the City Hall Building of DKI Jakarta Province. Data collection techniques use interview and documentation techniques. Testing the validity of the research data used is source triangulation. The data analysis technique in this research uses a data analysis technique model which consists of data collection, data reduction, data display, as well as verification and confirmation of conclusions.	Based on the research results, the implications for Jakarta Smart City In realizing Smart Governance for the DKI Jakarta Government, namely the development of a single data system that is integrated, up to date, and valid for policy formulation (data-driven policy), integrating all educational channels. complaints into the Citizen Relationship Management (CRM) system and there is an integrated citizen administration service system.
Technological Disruption in the Smart Society Concept with the Construction of the Society 5.0 Concept	(Kurniawan & Andiyani, 2021)	This research uses a qualitative approach and literature review to analyze the application of the Society 5.0 concept to smart society components.	In terms of the goals built into the SDGs, the role of technology and Artificial Intelligence (AI) in building collaborative spaces through the virtual world is possible as a solution to develop digital communities with the support of historical data on organizational activities that are already available to produce comprehensive information. This space can improve the quality of community interaction both physically and virtually.

Title	Author/Year	Method	Results
The AMO Concept in the Application of Ghrm Realizes the Digitalization of Health in the Environment Smart City	(Syaefuddina, et al., 2022)	The type used in this research is research with a combination of using a qualitative approach.	The features in the InDimensia Mobile App will of course continue to be improved and updated along with the growth of consumers who use it and the data continues to be analyzed through the AI process so that they can find out the latest trends that are consumers' needs and desires, thereby increasing the functionality and utility of the InDimensia Mobile App application. The public's readiness for the smart city concept which is part of Society 5.0 has been sufficiently felt but needs to be re-socialized among the community to explain the essence of it again. Smart City.
Digital Transformation in Realizing Klaten Smart City	(Seta et al., 2023)	The type used in this research is qualitative research.	From the results of this research, we can conclude that Klaten has been successful in applying digital technology to build a city that is smarter and more responsive to the needs of its residents. This research also shows how digital technology can be an important tool in the concept development of Smart City in other regions with similar contexts.

DISCUSSIONS

4.1 Influence of technology

Regarding the influence of technology in creating a Smart City, we can start it with information technology or with information services to the community with a smarter and technology-based concept. Digital technology can be applied to build a city that is smarter and responsive to the needs of the community. For example, the implementation of e-government that happened in Sumenep Regency through g-online became a pioneer from the birth of integrated government using an electronic-based system. This was then continued with the development of Smart City as an answer to the rapid development of e-government in the region (Alfiyah, 2019).

Digital innovation and technology change, replace or complement existing standards in certain companies, ecosystems, and sectors. This process of change is called "digital transformation". Technology and digitization affect all aspects of human life. Digital transformation is very important for businesses and government agencies that rely on information technology systems, strategies, and human resources. To improve the performance of organizations and public services in the public sector, information technology is also widely used (Khalida & Ridwan, 2023).

Digital transformation is an important part of the Smart City concept because it has great potential to improve efficiency, quality of life, and various aspects of urban life. This digital transformation includes the integration of various urban systems and services through ICT, which enables more efficient management of resources, better decision-making, and more efficient navigation. Digital technology enables the city to provide services that are more suitable to the needs of its citizens and provides a platform to innovate and collaborate with the private sector, educational institutions, and the general

public to overcome various problems (Setyasih, 2022).

Technology and digital play an important role in changing the urban landscape in digital transformation. Digital transformation such as Klaten Smart City refers to the utilization of digital technology to integrate various urban aspects. With the help of digital technology, the collection, analysis, and use of data becomes more efficient. The result of the implementation of Klaten Smart City with digital transformation is better decision-making, operational efficiency, and better quality of public services. Klaten Smart City can achieve a higher level of innovation and provide significant benefits for its residents by utilizing this technology. With the implementation of careful and targeted digital transformation, Klaten Smart City will be an inspiring example of how modern technology can change the quality of life of its citizens, improve the efficiency of public services, and create a more sustainable urban environment. This transformation will not only bring short-term benefits but also create a solid foundation for a brighter and more innovative future for Klaten and its residents (Seta et al., 2023).

2.2 Smart City

The development of increasingly advanced technology makes a change in the concept of 'smart' which is not only applied to various devices, but to various systems or arrangements. One of them that is being applied lately is the Smart City concept as one of the applications of e-governance. The so-called Smart City concept is a concept that prioritizes a smart city order that can play a role in making it easier for the community to get information accurately and quickly (Kurniasih & Wismaningtyas, 2020).

By definition, a Smart city is a city that can manage all resources effectively and efficiently in solving various challenges, using innovative, integrated, and sustainable solutions. The management is solely to improve the quality of life of the city's citizens. From the definition, the characteristic of the solution in a Smart City is in the form of new, integrated thoughts, between government agencies and non-government agencies, responsive to the city's problems and solutions that are designed to be sustainable solutions, not just temporary solutions (Firmansyah et al., 2022). The Smart City concept emerged as a demand for the need to build a city identity that is livable, safe, comfortable, green, climate and disaster-resistant, based on physical character, economic excellence, local culture, competition, technology, and IT. The purpose of Smart City implementation is to be able to form and implement a city that is safe, comfortable, controlled, and facilitates access for its citizens as well as strengthening the competitiveness of the city in terms of economy, society, and technology. So it can be explained that the purpose of the Smart City implementation strategy is to support the city in the social dimension (security), economy (competitiveness), technology, and environment (comfort). More generally based on the United Nations, it can be said that the purpose of a Smart City is to form a Sustainable city (economic, social, environmental). In general, the implementation of the Smart City concept has also started to run with the support of applications that continue to grow so that a creative environment is created in the field of technology, as a good first step toward a Smart City (Conoras & Hikmawati, 2018).

CONCLUSIONS

This research concludes that digital technology can be applied to build a city that is smarter and responsive to the needs of the community. Innovation and digital technology can change, replace, or complement existing standards in certain companies, ecosystems, and sectors. Digital transformation is the most important part of the Smart City concept because it has great potential to improve efficiency, quality of life, and various aspects of urban life. In addition, technology and digital play an important role in changing the urban landscape in digital transformation.

REFERENCES

- Alfiah, N.I. (2019). Pengaruh Penerapan e-Government Pada Pembangunan Smart City di Kabupaten Sumenep. *Jurnal Inovasi Ilmu Sosial Dan Politik (JISoP)*, 1(2), 88-95.
- Anthopoulos, L., & Fitsilis, P. (2010). From digital to ubiquitous cities: Defining a common architecture for urban development. In 2010 sixth international conference on intelligent environments. 301-306. IEEE.
- Amri, A. (2016). Analisis pemanfaatan teknologi informasi dan komunikasi dalam menunjang terwujudnya Makassar sebagai “Smart City”. *KAREBA: Jurnal Ilmu Komunikasi*, 431-445.
- Aryantie, M. H., Hidayat, M. Y., Widodo, T., Putra, A., & Dewata, I. (2023). Environmental Perspectives to the Rejection of Javanese Karst Mining in Systematic Literature Reviews. *International Journal of Sustainable Development & Planning*, 18(12). 3757-3764.
- Azhari, M., & Sutabri, T. (2024). Analisis Smart City Menggunakan Konsep Smart Society 5.0 Pada Electronic Policing. *Digital Transformation Technology*, 4(1), 138-146.
- Campbell, M., McKenzie, J. E., Sowden, A., Katikireddi, S. V., Brennan, S. E., Ellis, S., Hartmann-Boyce, J., Ryan, R., Shepperd, S., Thomas, J., Welch, V., & Thomson, H. (2020). Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline. *British Medical Journal*, 368, 1359–1364.
- Conoras, M. E. B., & Hikmawati, N. K. (2018). Smart City Peluang Dan Tantangan Untuk Papua Bangkit, Mandiri dan Sejahtera. *Konferensi Nasional Sistem Informasi (KNSI) 2018*.
- Firmansyah, A.W., Marcus, R.D., Ilmananda, A.S., & Pamuji, F.Y. (2022). Roaming profile-based user account management for strengthen the data protection in computer laboratory. *SMATIKA: STIKI Informatika Jurnal*, 12(2), 255-264.
- Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovi, N., & Meijers, E. (2007). *Smart Cities: Ranking of European Medium-Sized Cities*. Vienna University of Technology.

- Gunawan, H., & Lynawati, L. (2018). Analisis Penerimaan Teknologi “Smart City” Kota Purwokerto Dengan Model Technology Acceptance Model (TAM). Konferensi Nasional Sistem Informasi (KNSI) 2018.
- Hasibuan, A., & Sulaiman, O. K. (2019). Smart City, konsep kota cerdas sebagai alternatif penyelesaian masalah perkotaan kabupaten/kota, di kota-kota besar Provinsi Sumatera Utara. *Buletin Utama Teknik*, 14(2), 127-135.
- Izzuddin, F. N. (2022). Konsep Smart City dalam Pembangunan Berkelanjutan. *Citizen: Jurnal Ilmiah Multidisiplin Indonesia*, 2(3), 376-382.
- Joseph N. Pelton , Indu B. Singh (2019). *Smart Cities of Today and Tomorrow: Better Technology, Infrastructures and Society*.
- Khalida, W., & Ridwan, M. (2023). Transformasi Digital Dalam Pelayanan Publik: Peran Kearsipan Elektronik di Biro Umum Gubernur Sumatera Utara. *Moneter: Jurnal Ekonomi dan Keuangan*, 1(4), 31-40.
- Kitchenham, B. (2004). *Procedures for Performing Systematic Reviews*. Keele University. <https://www.inf.ufsc.br/~aldo.vw/kitchenham.pdf>
- Kurniasih, Y., & Wismaningtyas, T. A. (2020). Smart City Kota Magelang: Perubahan Manajemen Pemerintahan Daerah dalam Penerapan Electronic Governance. *JIAP (Jurnal Ilmu Administrasi Publik)*, 8(2), 356-367.
- Kurniawan, M. A., & Andiyan, A. (2021). Distrupsi Teknologi Pada Konsep Smart Society Dengan Kontruksi Konsep Society 5.0. *Jurnal Arsitektur Archicentre*, 4(2), 103–110.
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *PLoS Medicine*, 6(7).
- Putra, A., Dewata, I., Hermon, D., Barlian, E., & Umar, G. (2023). Sustainable development-based coastal management policy development: a literature review. *Journal of sustainability science and management*, 18(1), 238-246.
- Ramadhani, M. A., & Handoyo, E. (2022). Implementasi Kebijakan Jakarta Smart City dalam Mewujudkan Smart Governance pada Pemerintahan Provinsi DKI Jakarta. *Unnes Political Science Journal*, 6(2), 42-47.
- Saputro, W.T., & Darminto, B.P. (2019). Kajian Tentang Smart City: Paradigma, Kesempatan, Permasalahan Yang Ada Di Kabupaten Purworejo. *INTEK: Jurnal Informatika dan Teknologi Informasi*, 2(1), 1-9.
- Setyasih, E. T. (2022). Transformasi Digital Pemerintah Daerah di Era Society 5.0: Studi Kasus Di Provinsi Jawa Barat. *PAPATUNG J. Ilmu Adm. Publik, Pemerintah. dan Polit*, 5(3), 59-66.
- Seta, H.J., Suharto, D.G., & Setyowati, K. (2024). Transformasi Digital Dalam Mewujudkan Klaten Smart City. *National Conference on Applied Business, Education, & Technology (NCABET)*, 3(1), 669–679.

- Suhartono, I & Sina, I. 2020. Smart People In Smart City Analisis Sumber Daya Manusia Dalam Rangka Mewujudkan Kota Tangerang Selatan Yang Cerdas. *JENIUS*. 3(2), 1-5.
- Suhendra, A. (2017). Kesiapan Pemerintah Daerah dalam Mewujudkan Kota Cerdas di Bandung dan Surabaya. *Matra Pembaruan: Jurnal Inovasi Kebijakan*, 1(1), 1-9.
- Susanto, T.D., Samopa, E.F., & Wibowo, R.P. (2018). Government Resource Planning (GRP): Potensi dan Tantangannya di Indonesia. In *Seminar Nasional Teknologi Informasi dan Komunikasi (SEMNASITIK)*. 1(1). 826-839.
- Syaefuddina, M. A., Saifuddin, A., & Purwanti, W. (2022). Konsep AMO Dalam Penerapan Ghrm Mewujudkan Digitalisasi Kesehatan Di Lingkungan Smart City. *CAKRAWALA*, 29(2), 40–49.
- Taewoo, N & Theresa A. P. 2011. Conceptualizing Smart City with dimensions of technology, people, and institutions. In *Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times (dg.o '11)*. Association for Computing Machinery, New York, NY, USA, 282–291.
- Washburn, D., Sindhu, U., Balaouras, S., Dines, R. A., Hayes, N. M., & Nelson, L. E. (2010). *Helping CIOs Understand "Smart City" Initiatives: Defining the Smart City, Its Drivers, and the Role of the CIO*. Cambridge, MA: Forrester Research, Inc. Available at http://public.dhe.ibm.com/partnerworld/pub/smb/smarterplanet/forr_help_cios_under_smart_city_initiatives.pdf.