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Systematic Review on Public Services in the Implementation of Smart City Using VOSviewer

Tinjauan Sistematis Pelayanan Publik dalam Penerapan Smart City Menggunakan VOSviewer

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ABSTRACT
This research focuses on the development of online services using Artificial Intelligence (AI) created to build a concept of smart city based on E-Government. The focus of this research is to answer the question: Is the implementation of smart city effective in improving the quality of public services? The impact of smart city implementation on the development of public services is also discussed. The results of this research show that governments in the Asian region are increasingly utilizing AI for ubiquitous connectivity, and a range of other technologies to help solve the most pressing urban issues, ranging from population growth and congestion to environmental sustainability as well as improving administrative effectiveness. The use of chatbots is also utilized by the governments in Asia to assist conversations with AI technologies in managing service issues. These findings shed light on an important theoretical foundation focused on human-computer interaction and clarify the benefits of using AI technologies.

Kata Kunci
Kota Pintar;
Pemerintahan Elekronik;
Kecerdasan Buatan;

ABSTRAK
Studi penelitian ini berfokus pada pengembangan layanan online dengan menggunakan Artificial Intelligence (AI) yang dibuat untuk menciptakan konsep smart city berbasis E Government. Fokus dari studi penelitian ini adalah untuk menjawab pertanyaan: Apakah implementasi smart city efektif dalam meningkatkan kualitas pelayanan publik? Dampak dari implementasi smart city terhadap perkembangan pelayanan publik juga dibahas. Hasil dari penelitian ini menunjukkan bahwa pemerintah di kawasan Asia semakin memanfaatkan AI untuk konektivitas di mana-mana, dan berbagai teknologi lainnya untuk membantu memecahkan masalah perkotaan yang paling mendesak, mulai dari pertumbuhan penduduk dan kemacetan hingga kelestarian lingkungan dan meningkatkan efektivitas administrasi. Penggunaan chatbot juga dimanfaatkan oleh pemerintah di Asia untuk membantu percakapan dengan teknologi AI dalam mengelola masalah layanan. Temuan ini menjelaskan landasan teori penting yang berfokus pada interaksi manusia-komputer dan memperjelas manfaat penggunaan teknologi AI.

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Introduction

Smart city is an urban concept that applies the information and communication technology (ICT) to improve services. Cities with smart city concepts facilitate its people to get services easier. Smart city has become a popular policy in recent years, in line with two main trends: (1) the accelerated development of technology in the Industrial Revolution 4.0 Era, including the Internet of Things (IoT), big data processing, and artificial intelligence (AI); as well as (2) the rapid growth of the urban population, of which more than half now live in urban areas. IoT has fundamentally changed urban life by enabling the collection and analysis of data from sensors and connected devices, providing increased efficiency, reduced costs, and improved quality of life (Prakoso et al., 2023). Through the provision of innovative technological solutions, efforts to address diverse urban challenges have transformed the way people manage and adapt to life in cities (Joo & Tan, 2020).

Many Asian countries are implementing the smart city concept to make it easier for citizens to access services provided by their governments. For example, in 2015, India announced its plan to build 100 smart cities, while Singapore launched its Smart Nation initiative in 2014. South Korea and Japan have developed a series of cities spread across various locations, emphasizing eco-friendly principles as government services (Joo & Tan, 2020). In implementing Smart City, there needs to be careful planning in order to develop technology that supports the delivery of public services based on the development of science and technology, which is currently progressing rapidly. This technology development effort involves preparing a complete infrastructure to support the implementation of e-government, including the preparation of resources such as hardware, software, and skilled human resources (Joo & Tan, 2020).

In recent times, China has also come under scrutiny for its enthusiasm in adopting the latest smart technology or AI to manage cities. China has also launched hundreds of smart city pilot projects - an unimaginable scale for most countries. AI has greatly helped the Chinese government in developing its services. For example, AI technologies that China has created include social credit evaluation systems, cashless payments, artificial intelligence-based intelligent transportation networks, and facial identification technologies (Joo & Tan, 2020). One of the countries in Southeast Asia, Singapore, has implemented e-government by utilizing AI very well with the existence of e-government development index data. Singapore's ranking is always high. In 2010, Singapore was ranked 11th in the e-government development index. Then in 2012, the ranking increased to 10, and in 2014, it rose again to rank 3. However, in

2016, 2018, 2020, and 2022, its ranking declined to 4, 7, 11, and 12 respectively (V. Arief, 2023).

The policy of e-government development in Indonesia has started since the issuance of Presidential Instruction number 3 of 2003. Since then, various other policies have been implemented, and institutions that support e-government development have been established. These range from independent institutions such as the National Information and Communication Technology Council to units within ministries (Masyhur, 2017). Indonesia is developing an e-government system through ministries/organizations on one of the policies that makes its performance system more efficient, with future bureaucratic affairs being done by Artificial Intelligence (AI). If replaced by Artificial Intelligence, our bureaucracy will be faster. Indonesia needs a bureaucratic system that is fast, simple, and straightforward. This bureaucratic digital transformation effort can be seen from the decreasing number of civil servants. This decline occurs because the number of civil servant recruits is smaller than the number of civil servants who retire each year. The vacant positions are replaced by the use of information technology (IT) and digitization of public services (Yusep Mulyana, 2022).

In the development of e-government, there are various benefits obtained by the community, such as the ease of accessing services provided by the government. In its implementation, e-government has an Artificial Intelligence (AI) system to make it easier to improve its services. By implementing e-government transformation, government agencies can optimize and utilize advances in Information and Communication Technology (ICT) to provide the widest possible access to information and services desired by the public. This is also the result of the rapid development of ICT and the wide opportunities for its use in the midst of the globalization era (Napitupulu, 2016). With the advancement of technology and Internet infrastructure, governments in various countries have adopted information and communication technology (ICT) to improve the efficiency and effectiveness of public services (Ha, 2016). E-government portals or websites have become a key tool for governments to enhance administrative processes, interact with their citizens efficiently, and build close relationships with communities, businesses, and other institutions (Tan et al., 2013).

This research offers the concept of Smart City with the use of artificial intelligence (AI) and the implementation of e-government in improving the efficiency and effectiveness of public services in Asia including in Indonesia. By focusing on the concept of smart city based on the use of artificial intelligence (AI) and implementing e-government, the application of AI-based public services in Indonesia is relevant to other Asian countries. This can be supported through the application of artificial intelligence (AI) in the public sector in Indonesia, which

has been regulated in the National Strategy for Artificial Intelligence/ *Strategi Nasional Kecerdasan Artifisial* (Stranas KA). Within this framework, the Ministry of Communication and Information of the Republic of Indonesia (Kemenkominfo RI) has a key role as the government's center of focus in realizing national digital transformation as the development of bureaucracy and public services (Di et al., 2024). Other Asian countries are also utilizing AI to develop public service, such as China which utilizes AI as a facilitator of government services and administration (Tao et al., 2019). What distinguishes this research from previous research is that this research focuses on the utilization of artificial intelligence (AI) and the implementation of e-government as a public service within the scope of Asian countries.

This research focuses on the implementation of the Smart City concept with the use of artificial intelligence (AI) and the application of e-government in improving public services in Asian countries. Many things can be discussed in this research such as what should be applied in the E-Government system to facilitate services for the community and what AI services will be used by governments in Asia. The focus of this research is the impact of smart city implementation on the development of public services. This research tries to answer the question: Is the implementation of smart city effective to improve the quality of public services?

Literature Review

E-Government Concept in Asian City

E-Government refers to a method of managing government and providing public services that utilizes the advancement and complexity of information and communication technology. This concept emphasizes public service management that relies on information and communication technology infrastructure. The presence of e-government marks a response to the shift of paradigm in public service delivery, which relies heavily on the use of information and communication technology. The concept of e-government has been implemented in various countries since the early 2000s, especially in Asia, Southeast Asia, and East Asia (V. Arief, 2023). Smart cities can be used as a learning method for many communities, such as learning about technology, the times, and etc. (Alghamdi, 2023). Countries in the Asian region have achieved significant progress in implementing e-government by utilizing information and communication technology (ICT) to improve government efficiency and spending effectiveness, provide more user-friendly government services, expand public access to information, and promote government accountability to the people (Clay G. Wescott, 2001). There is a city in Asia implementing the concept of e-

government until now, namely Seoul. Seoul is a city in South Korea that applies the concept of e-government. The people in Seoul are very receptive to the concept of e-government as indicated by the public's marking of the government using the concept of e-government (Lee, 2023). E-government involves the use of information and communication technology (ICT) to improve efficiency and effectiveness in promoting better government administration and simplifying the provision of government services, providing greater access to information for the public, and asserting the government's obligations to its citizens (C. Wescott, 2004). The adoption of e-governance offers many benefits, such as increasing transparency, accountability, efficiency, and citizen involvement in government decision-making, as well as accelerating the resolution of public issues (Sudarsono et al., 2024).

There is one example of a city in Indonesia that is currently implementing the concept of e-government, namely the City of Yogyakarta. It is an area influenced by global technological advancements, and needs to adopt various existing innovations to continue to grow. One step that can be taken is to implement the electronic government or e-government. With various services provided by the government to various parties under it, it is a challenge to implement e-government in the city (Novriando & Purnomo, 2020). The implementation of the e-government concept in Yogyakarta City is regulated in the Mayor Regulation No. 15/2015 regarding E-Government. In the regulation, there is a roadmap for E-Government development that includes several stages within the scope of Yogyakarta City, including (1) network infrastructure improvement, (2) information system infrastructure improvement, (3) data integration and application development, (4) data warehouse, and (5) policies towards Smart City (Wahyudi et al., 2022).

Computer network is one of the implementations of e-government that is developed as a connecting service between communities (Sun, 2021).The development of information and communication technologies (ICT) such as laptop computers, cell phones, PDAs (Personal Digital Assistants), as well as various services such as email, instant messaging, and other networks, brings new opportunities to improve interaction and mobility (Song, 2005). Along with the advancement of information technology, governments in Asian countries and even in the world are now increasingly competing in utilizing information technology to carry out their administrative tasks (Gusman, 2018). Conceptually, E-Government refers to the creation of interactive platforms that provide easy, transparent, and economical access between government and citizens (G2C - government to citizens), between government and business (G2B - government to business enterprises), as well as between government and other government agencies (G2G - inter-agency relationships) (Khattab et al., 2015).

Asia is a continent with countries implementing e-government. Asian countries include China, Indonesia, Philippines, Taiwan, Japan, and etc. Asia consistently scores high in e-government and digital surveys, as their governments proactively adopt innovative technologies and tools. The concept of e-government emphasizes the importance of innovation in handling various city problems by utilizing ICT, sensors, and data analysis as supporting factors to facilitate problem solving (Aziz & Achmad Djunaedi, 2022). Hence, tech-savvy workers are required. However, colleges and universities in Asia still face challenges in producing workforces skilled in the utilization of information technology (McQuiston & Manoharan, 2021). IT (Information Technology) is part of the implementation of e-government, and in order to create e-government, it is necessary to have enough workers in government organizations who are experts in the field of IT (Information Technology). With sufficient government employees who are experts in IT, the implementation of e-government which has the aim of effective and efficient public services can be realized (McQuiston & Manoharan, 2021).

Online Services Using Artificial Intelligence

The Internet of Things (IoT) is emerging as a computing technology. IoT is characterized by various technologies and heterogeneous devices that can connect to the Internet. Efforts on current and future research and development aim to add AI into IoT systems, allowing devices to become smart and thus making autonomous decisions in performing online services easier. In addition, such AI has the ability to interact not only with other smart devices but also with humans (Daniel & Natalia, 2019). Artificial intelligence (AI) has grown rapidly in recent years. AI and IoT (Internet of Things) enable the use of big data applications, machine learning algorithms, deep learning, knowledge discovery, neural networks, and other technologies. Many governments in Asia use this system for service development (Ma et al., 2020).

The construction of smart cities has undergone major changes with five major characteristics: big data, intelligence, innovation, interaction, and integration. Additionally, internet giants have emerged in the field of public services in smart cities. The utilization of AI applications is part of these five characteristics of smart cities (J. Zhou, 2022). Smart City is one of the breakthroughs of many governments in Asia in creating applications to facilitate online services. The creation of leading applications based on AI is one of the parts of e-government (Myeong, 2022). Smart applications can be well utilized to improve systems in Governance. Many countries in Asia have utilized smart applications to improve their service facilities, such as in China (Dong & Dong, 2021). By building the city into a Smart City that

utilizes artificial intelligence (AI), it will have a good impact on improving the public service performance system (M. Zhou et al., 2022).

China has been promoting the use of AI to transform services as a form of public sector innovation. Many other Asian countries are also following China in using AI as a service to make it easier for people to develop public services. Asian cities are increasingly utilizing AI as ubiquitous connectivity, and a range of other technologies to help solve the most pressing urban problems, from population growth and congestion to environmental sustainability as well as improving administrative effectiveness (Zheng et al., 2019). AI is needed for mechanized, analytical, intuitive, and empathetic service tasks, and explains how government online services should decide between humans and machines to complete demanding tasks (Huang & Rust, 2018). The governments in Asia also utilize chatbots to assist conversations with artificial intelligence (AI) to manage service issues. These findings shed light on important theoretical foundations focused on human-computer interaction and clarify the benefits of using AI technologies (Camilleri & Troise, 2023). Until now, artificial intelligence has undergone development in various forms and has been successfully implemented in diverse sectors, such as aviation, computer science, finance, education, healthcare, medicine, transportation, industry, and others (Sudarsono et al., 2024). Online services can be useful in various fields. One idea of the smart city concept is the belief that artificial intelligence (AI) products will transform big data from internet transactions in all aspects of life into new knowledge that has the potential to improve human capabilities in creating new opportunities for mankind (Sekolah & Elektro, 2018). Beijing is one of the Asian cities benefiting from Artificial Intelligence (AI). Beijing utilizes an AI chatbot to support the convenience of its community services. Artificial Intelligence (AI) chatbots are being used to facilitate community services. AI chatbot is a natural language. At the most basic level, an AI chatbot can be asked any question, and it will generate an answer (Eriana & Zein, 2023).

New innovations in digital technology are rapidly changing the way public services are delivered. Mobile devices, along with its associated applications, facilitate access to online public services in multiple locations for citizens. Networking and wi-fi technologies enable location-based information and data to be integrated with conventional administrative data, forming large data sets that help in understanding populations and individuals in greater depth. Administrative decision-making processes are increasingly automated, with the help of artificial intelligence (AI) through machine learning, which provides a more sophisticated approach to making decisions much easier (Henman, 2020).

Methode

This research was developed based on the overall process of data collection and data screening. At the early stage of a bibliometric review, it is important to clarify the research objectives. This research primarily aims to analyze the publication trends from a compilation of publications related to smart cities in improving the quality of public services. The investigation was completed through a descriptive analysis using a document examination approach. In this analysis, the database of Scopus was searched for keywords such as "online services, digital public services, E-government services" to retrieve data as of October 1st, 2023. The Scopus database was chosen since it has extensive documents compared to Web Science and PubMed and has been frequently cited in previous studies. This bibliometric review is conducted based on a selection strategy and research protocol adapted from the PRISMA flow diagram (Kamioka, 2019).

To effectively analyze a large amount of data collected from a database and investigate relevant research in terms of publication output, research direction, most active countries, and evolution of the field studied, the researchers applied the bibliometric analysis. The research methodology used in this research was based on a quantitative and qualitative approach using bibliometric analysis as well as the Visualization of Similarity (VOS) method to understand the intellectual structure of the metaverse and uncover emerging trends in published scientific articles (Brahimi & Haneya, 2023).

This was a systematic literature review following the framework of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Kamioka, 2019). Articles were searched on October 1st, 2023, through three databases (SCOPUS, VOSviewer, and Google Scholar) using the following terms: ("E-Government" OR "Artificial Intelligence" OR "Smart City") 2023. References of each as well as abstracts, keywords and full text in PDF were added. A free web-application was used to screen the title and abstract of each citation. Articles that did not meet the inclusion criteria were excluded, while articles that met the inclusion criteria were included and exported to a RIS file containing the final sample. Only one reviewer filtered the title and abstract and then the text using Rayyan. VOSviewer was used to create a map of the main keywords and authors present in the RIS files with the final sample that can be visualized and explored. Furthermore, automatic coding was applied to obtain a dendrogram that allowed the researchers to identify the most frequently used terms with the results from the co-occurrence map obtained using VOSviewer. In addition, citations were also analyzed to identify the most relevant authors, journals, and Asian countries where most of the research was conducted (Tâm et al., 2016).

Scopus data is obtained through a search strategy according to Sulistyaningsih et al. (2023). The process of data searching through the Scopus database can be done based on the keywords used. Hence, the data searching is carried out as follows (REF (electronic AND service AND delivery) OR REF (online AND services) OR REF (digital AND public AND services)) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND AND (LIMIT-TO (EXACTKEYWORD, "Information Systems") OR LIMIT-TO (EXACTKEYWORD, "Artificial Intelligence") OR LIMIT-TO (EXACTKEYWORD, "Service Quality") OR LIMIT-TO (EXACTKEYWORD, "Internet Of Things") OR LIMIT-TO (EXACTKEYWORD, "Network Security") OR LIMIT-TO (EXACTKEYWORD, "E-government")) AND (LIMIT-TO (AFFILCOUNTRY, "Singapore") OR LIMIT-TO (AFFILCOUNTRY, "Japan") OR LIMIT-TO (AFFILCOUNTRY, "Hong Kong") OR LIMIT-TO (AFFILCOUNTRY, "South Korea") OR LIMIT-TO (AFFILCOUNTRY, "China").

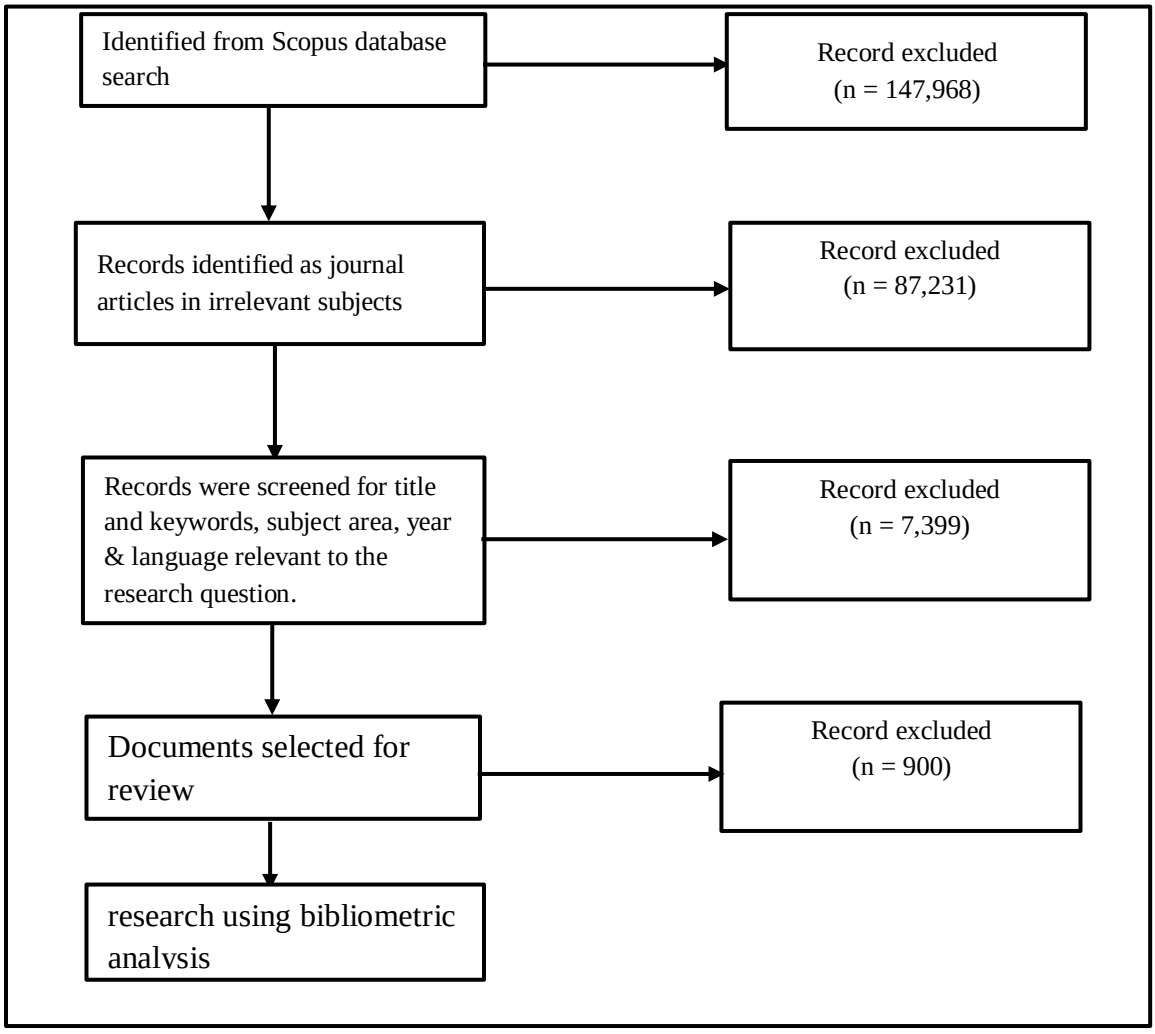

Figure 1. Article Selection Process

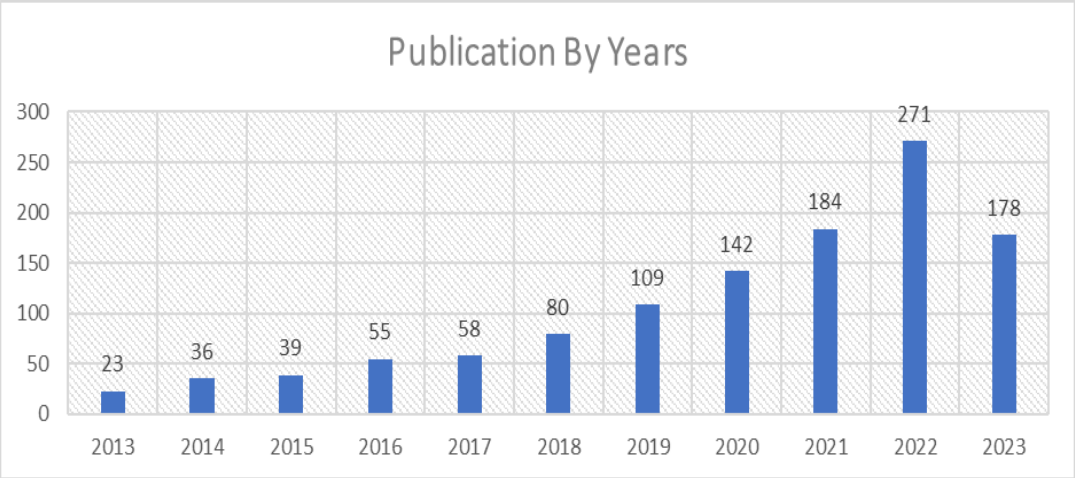

Figure 2. Publication by Years

Figure 2 shows that there is data that illustrates the rapid development of the trend of articles with the theme of smart services (electronic service delivery, online services, and digital public services) in recent years. There were 23 articles in 2013, 36 articles in 2014, 39 articles in 2015, 55 articles in 2016, 58 articles in 2017, 80 articles in 2018, 109 articles in 2019, 142 articles in 2020, 184 articles in 2021, 271 articles in 2022, and 178 articles in 2023. From 2018 to 2022, there was an increase in the trend of electronic service delivery, online services, and digital public services. Meanwhile in 2023, there was a decrease in the trend of smart services, declining from the previous 271 articles in 2022 to 178 articles in 2023. In a decade, studies on smart cities have shifted based on research topics (Alghamdi, 2023).

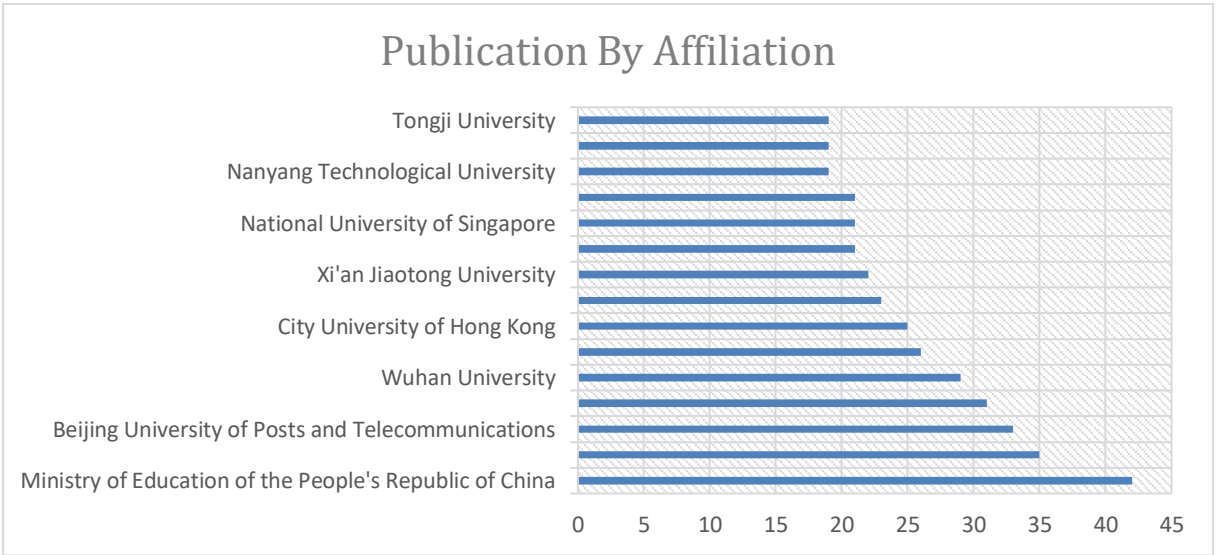

Figure 3. Publication by Affiliation

Figure 3 shows publication data based on affiliation obtained through Scopus. Ministry of Education of the People's Republic of China has the most publications with 42, followed by Huazhong University of Science and Technology (35 publications) and Beijing University of Posts and Telecommunications (33 publications). In Hong Kong, The Hong Kong Polytechnic University and City University of Hong Kong have 31 and 25 publications respectively. Meanwhile, some universities in Singapore such as the National University of Singapore (21 publications) also has made significant contributions in scientific research and publications. Finally, the least number of publications is achieved by Nanyang Technological University, Harbin Institute of Technology, and Tongji University with only 19 publications. Researches on smart cities focus on the service system developed by the government (Dong & Dong, 2021).

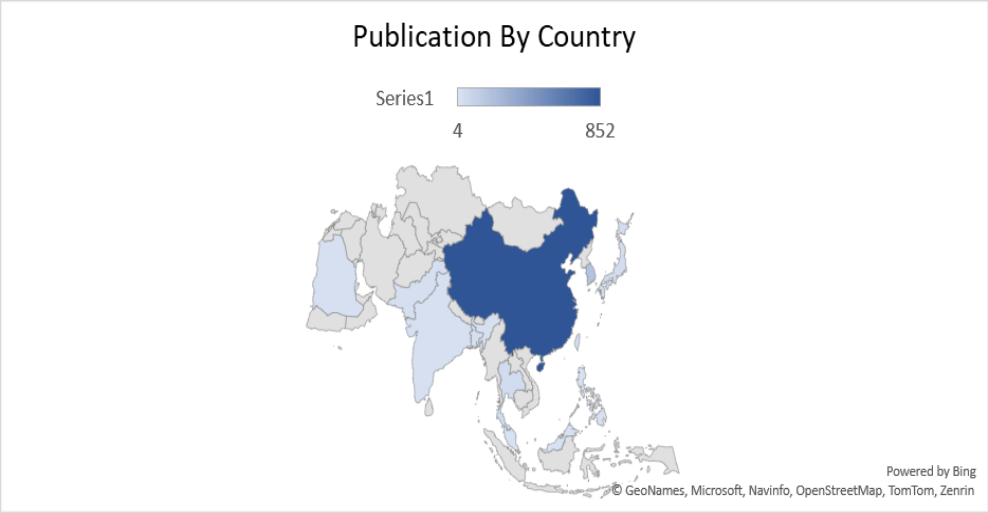

Figure 4. Publication by Country

In Figure 4, there is data that shows the average number of authors from various countries with the theme of electronic service delivery, online services, and digital public services. In this data, most of the writings come from China with a total of 852 article publications. It is followed by South Korea with a total of 191 article publications, Hong Kong with 81 article publications, Singapore with 51 article publications, Thailand with 41 article publications, Japan with 37 article publications, Taiwan with 34 article publications, Bangladesh with 30 article publications, Pakistan with 27 article publications, India with 23 article publications, Saudi Arabia with 22 article publications, Malaysia with 17 article publications, Philippines with 14 article publications, and the last one is Qatar with 4 article

publications. Thus, it can be concluded that Qatar is the country with the least number of published articles related to the theme of electronic service delivery, online services, and digital public services, with only four published articles. China is the country that has implemented the concept of smart city the most in its cities to improve service quality (M. Zhou et al., 2022).

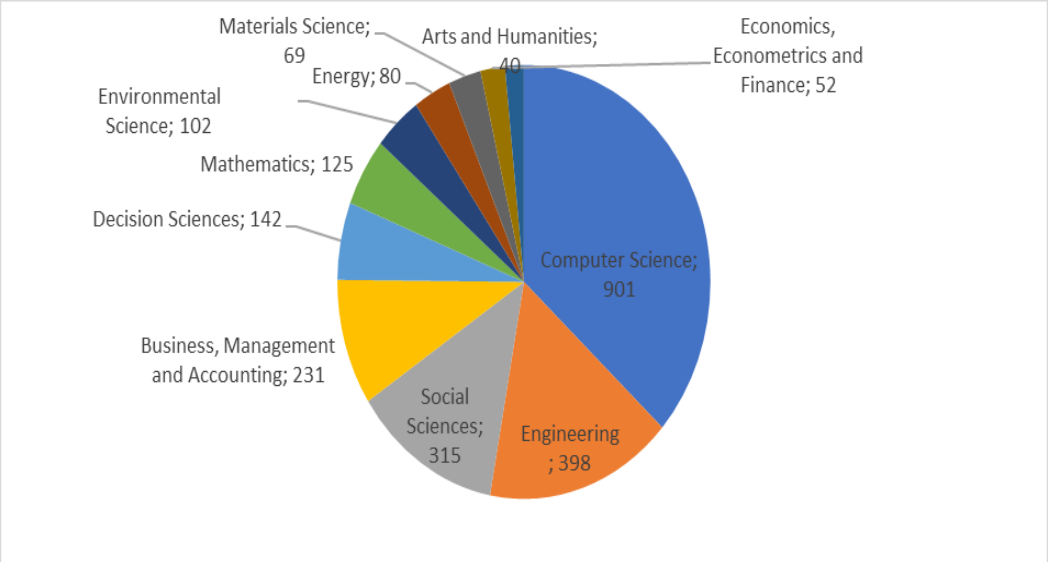

Figure 5. Publication by Subject Area

Figure 5 explains the data on Publication by Subject Area, reflecting researches in various fields related to smart services (electronic service delivery, online services, and digital public services) distributed in the Scopus database. Computer Science is the most dominant subject area with 901 studies, showing its important role in the development of smart services. Meanwhile, Engineering has contributed 398 studies, emphasizing the integration of technology in the provision of public services. Social Sciences has 315 studies addressing the social impact and the use of digital public services. Business, Management and Accounting has contributed 231 studies, highlighting the adoption of smart services in business management. Decision Sciences makes 142 studies, assisting in the development of smart service strategies and policies. Mathematics provides the technical basis with 125 studies supporting the development of smart services. Environmental Science has 102 studies, looking at the environmental impact of smart services and digital sustainability. Materials Science has 69 studies, assisting in the development of materials for smart service technologies. Next is Economics, Econometrics and Finance with 52 studies, exploring the economic and financial aspects of digital public services. Arts and Humanities provides cultural insights through 40 studies in the context of smart services. Finally, Physics and Astronomy, with 34 studies,

reveals the role of technology in scientific research. Discussions on developing cities into smart cities using computer science are ongoing in Asian countries (Sun, 2021).

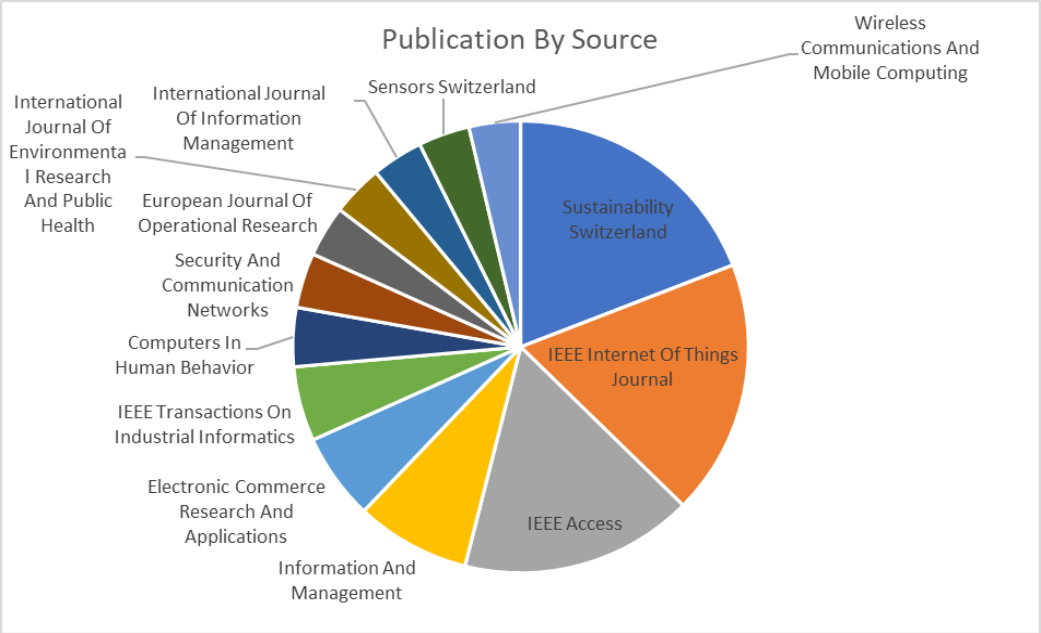

Figure 6. Publication by Source

Figure 6 above shows data indicating the distribution of scientific researches relevant to the keywords "electronic service delivery," "online services," and "digital public services" in the Scopus database, along with the leading sources that have published researches in this context. Some of the most prominent sources of research on digital public services and electronic service delivery are from scholarly journals. Sustainability Switzerland has 68 studies related to various aspects of sustainability in digital public services, showing publications on sustainable practices. IEEE Internet of Things Journal publishes 65 studies. This journal is instrumental in understanding how the Internet of Things (IoT) affects the delivery of electronic public services. Following, IEEE Access provides 59 studies, presenting a wide range of research related to technologies used in digital public services. Journal of Information and Management contributes 29 studies, addressing information management in the context of digital public services. Electronic Commerce Research and Applications has 22 studies focusing on researches in electronic commerce applications related to public services. Journal of IEEE Transactions on Industrial Informatics provides 19 studies, addressing public information in the context of electronic public service delivery. Journal of Computers in Human Behavior highlights aspects of human behavior in the use of digital public services with 15 studies. Meanwhile, journal of Security and Communication Networks shares 14 studies

focusing on security and communication networks in digital public services. In the development of research in Asian countries, Seoul becomes the object of research as a smart city-based city (Lee, 2023).

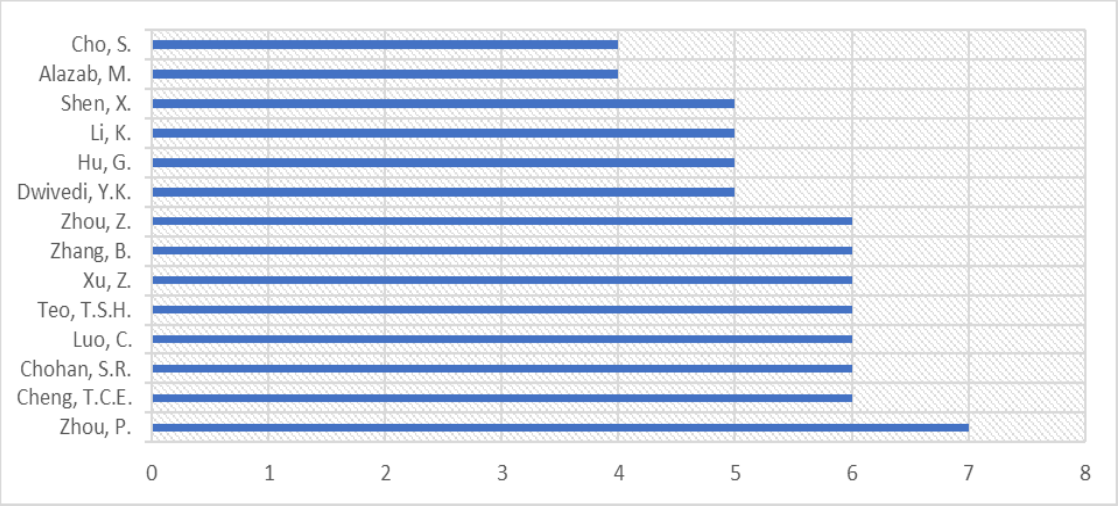

Figure 7. Publication by Authors

Figure 7 contains data on the Publication by Authors. This authors' data is retrieved from articles with the theme of smart services (electronic service delivery, online services, and digital public services). The data is taken from Scopus from 2013 to 2023. The data shows the number of articles published by each author. Zhou, P has 7 publications, followed by Cheng with 6 publications, Chohan, S.R with 6 publications, Luo, C with 6 publications, Teo T.S.H with 6 publications, Xu, Z with 6 publications, Zhang, B with 6 publications, Zhou, Z with 6 publications, Dwivedi with 5 publications, Hu with 5 publications, Li with 5 publications, Shen with 5 publications, Alazab with 5 publications, and the last one is Cho, S with 5 publications. The author with the most smart service-themed articles is Zhou, P and the authors of the least articles are Alazab and Cho. Smart City is one of the recommendations from the author of the article that proposes city services for people based on artificial intelligence (AI) (J. Zhou, 2022).

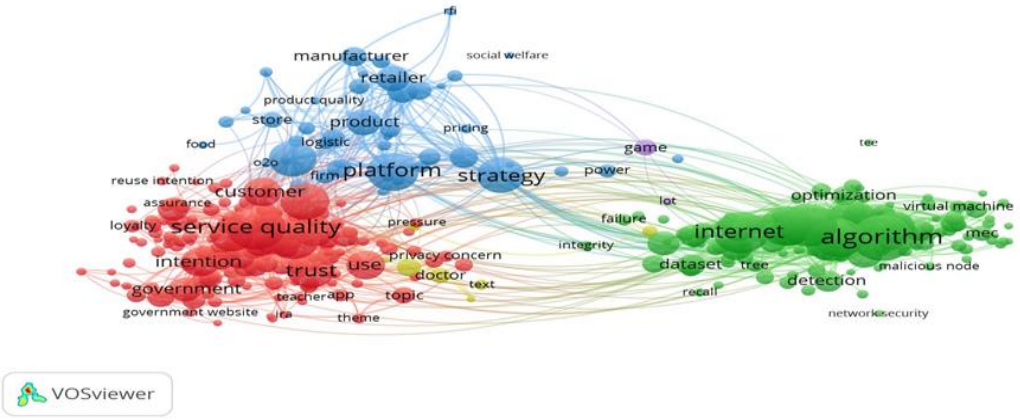

Figure 8. VOSviewer Network Visualization

In the VOSviewer Network Visualization, there are four color sections reflecting the various prominent elements. The red section highlights the element of Service Quality as the main focus. Meanwhile in the blue section, the two most prominent elements are Platform and Strategy, which tend to play a crucial role in the context of the analysis. Meanwhile, in the green section, the two most prominent elements are Internet and Algorithm, reflecting significant aspects of information technology. In the yellow section, no elements stand out, perhaps indicating that this category have no significant impact in the context of the network visualization. Overall, the network visualization provides an overview of the dominant and relevant elements in the data analysis, with a particular focus on Service Quality, Platform, Strategy, Internet, and Algorithms.

Table 1. Group Items by Cluster VOSviewer

Cluster	Item	Number of item
Cluster 1	Chatbots, citizen satisfaction, city, college student, convenience, customer, digital technology, E-government, E-government development, E-government service, government website, information quality, new technology, mobile payment, online services, online service quality, online survey, public service, responsiveness, self-service technology, tourism industry	165
Cluster 2	Privacy issue, Privacy, Paradigm, Physical Machine, Network traffic, Network Security, Network edge, Network, Micro-service, Mobile Device, Mobile edge computing, Multi-access edge company, IoT device, IoT network, IoT application, IoT, industrial internet, server, security analysis, security service, sensitive information, Social Internet, Social Network, Smart City, Smart contract, vehicle, virtual machine	141
Cluster 3	E-commerce platform, IoT technology, logistic, logistic service, marketplace, manufacture, offline channel, online, online retailer, online shopping, platform, product, product quality	45
Cluster 4	Empirical analysis, cluster, network analysis	7
Cluster 5	IoT, ICT, Information	3

Source: Processed by author through VOSviewer

Table 1 indicates the cluster analysis results, with the first group involving 165 items that focused on topics such as chatbots, citizen satisfaction, digital technology, and public services. The second group, with 141 items, focuses on privacy issues, network security, IoT, and Smart City concepts. Meanwhile, the third group, with 45 items, highlights the important role of e-commerce platforms, IoT technology, and logistics in online services. The fourth group consists of 7 items focusing on empirical analysis and network analysis. Whereas the fifth group, with only 3 items, highlights the presence of IoT, ICT, and Information in the data. This analysis contributes in categorizing key elements and clarifying important issues of focus and trends in the dataset.

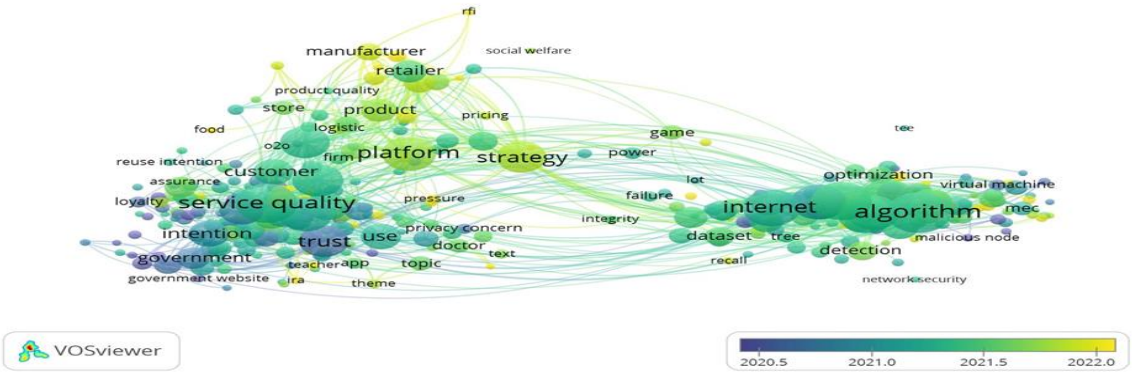

Figure 9. VOSviewer Overlay Visualization

In the VOSviewer Overlay Visualization, it can be seen that several themes are significantly highlighted, including Service Quality, Platform, Strategy, Internet, Algorithm, and Internet Optimization. These themes appear to dominate in the context of data analysis. On the other hand, there are some themes such as teacher, theme, food, and store that are not highlighted as clearly as the main themes. Nonetheless, they may have their own roles or contributions in the overall context of the data, but visually, they do not stand out as strongly as the main themes. The VOSviewer Overlay Analysis provides insight into the themes that are the main focus as well as identifies elements that may have a lower impact in the dataset.

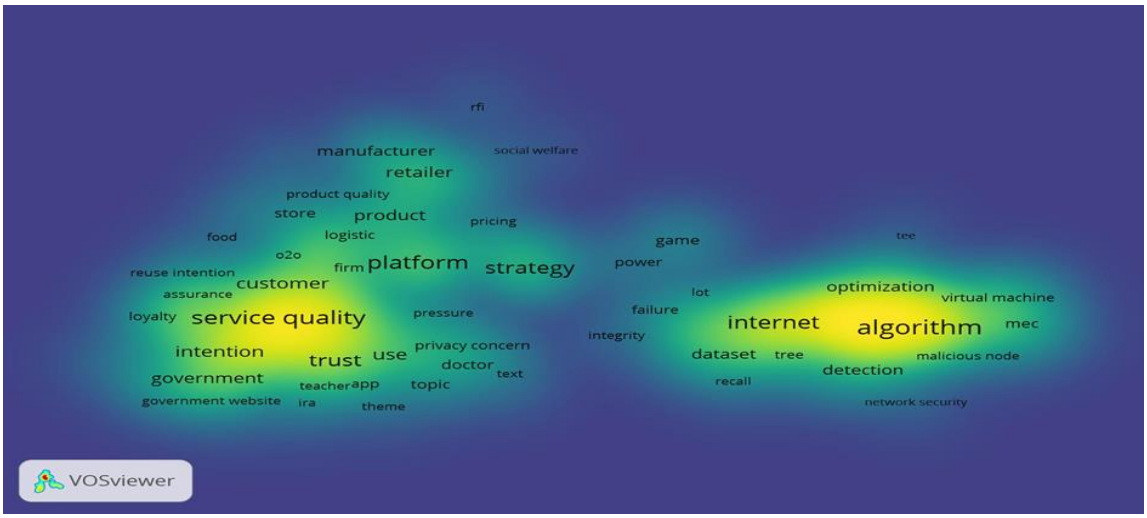

Figure 10. VOSviewer Density Visualization

In the VOSviewer Density Visualization, it can be seen that the most prominent themes among other themes are Service Quality, Internet, and Algorithms. Although there are many other important themes such as Internet of Things (IoT) and government website, Service Quality, Internet, and Algorithm are visually more dominant in the analysis. The clarity in the

prominence of these themes suggests that these aspects may have a significant impact or higher relevance in the dataset. The VOSviewer density analysis provides a clear visual understanding of the dominating themes, making it easier to identify the main focus in the theme analysis being conducted.

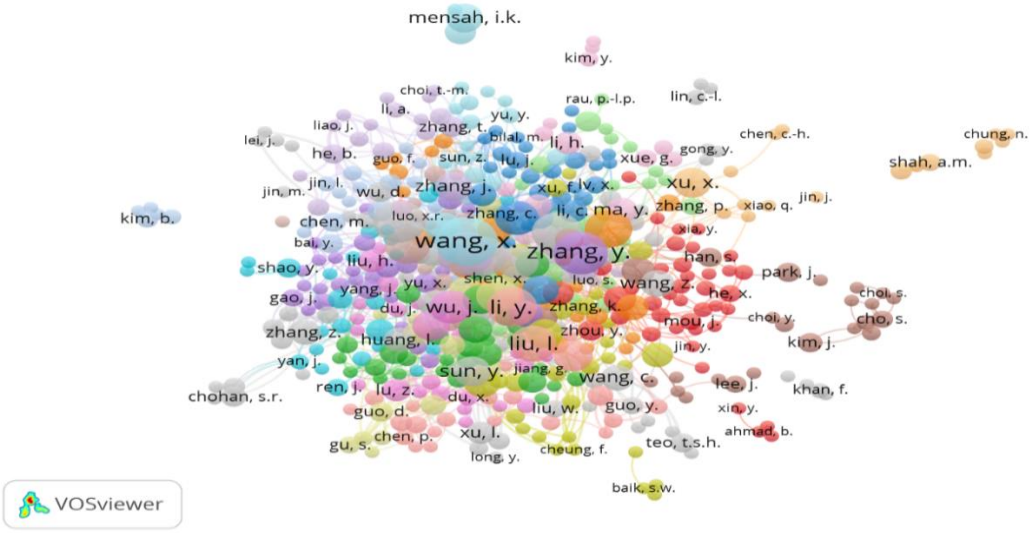

Figure 11. Publication by VOSviewer Bibliographic

In Figure 11, there are many author names indicated from various countries, especially Asian countries that discuss smart cities. The most prominent writing is by Wang, X entitled "Energy-efficient virtual machine placement in data centers via an accelerated Genetic Algorithm with improved fitness computation" (Hormozi et al., 2022). Smart city is a concept of city order that is widely applied in various cities now. Therefore, smart city is an interesting research for researchers in the last 10 years. Smart city based on e-government and online services that utilize artificial intelligence is a new breakthrough for governments in Asian countries to make it easier for their people to access services provided by the governments.

Table 2. Selected Keywords on E-Government Services and Online Services

Term	Occurrence	Relevance	Term	Occurrence	Relevance
Algorithm	443	1.08	Chatbot	23	1.04
Service Quality	409	0.74	Government Website	17	1.64
Social Network	42	0.67	Online Service	16	1.06
Internet	353	0.55	Transparency	15	0.88
Network	344	0.96	Social Internet	14	1.27
IoT	327	0.74	Self-Service Technology	12	1.57
E-Government Service	46	1.24	Online Service Quality	11	1.36
Blockchain	101	0.65	Security Service	11	1.04
Platform	305	0.43	Mobile Device	11	1.01
Government	120	1.12	Cloud Computing	42	1.01

Source: Processed by author through VOSviewer.

Table 2 is the result of the data found in VOSviewer. From the data analysis, it can be known that there are a number of relevant terms and its frequency in a particular context. Algorithm, with 443 occurrences, has a relevance rate of 1.08. Service Quality dominates with 409 occurrences and a relevance rate of 0.74, highlighting its significance in the study. Internet, Network, and IoT (Internet of Things) reach 353, 344, and 327 occurrences respectively, with relevance levels varying from 0.55 to 0.96. E-Government Service, with 46 occurrences and a relevance rate of 1.24, emphasizes the importance of electronic government services. Government also has a significant impact, with 120 occurrences and a relevance rate of 1.12, reflecting its strong role in the discussion. In addition, several concepts such as Chatbot, Government Website, and Self-Service Technology also attract attention with fairly high relevance levels of 1.04 to 1.57 respectively. These findings give an idea of the focus and weight of the concepts that emerged in the analysis, providing valuable insights into the technology and service issues discussed.

Result and Discussion

Smart City is a systematic concept implemented in a city, where all existing infrastructure and systems aim to facilitate the various parties involved in the city. Many Asian countries have adopted this smart city concept as it is considered a sign of sophistication and progress. With the adoption of advanced technology, it is expected that the city can be more effective and efficient in implementing public services (Putra, 2019).

E-Government-Based Smart City as a Public Service

Smart City based on e-government is a concept that integrates information and communication technology (ICT) to improve the efficiency and effectiveness of city government. With this approach, city governments can provide public services more efficiently and responsively to the needs of their citizens. One of the e-government-based smart city concepts implemented by most governments in Asia is to provide email access to the public to send direct messages in the form of criticism or suggestions to improve existing public services. Email has a number of advantages over other communication systems. Since it is informal, email is able to increase the flow of communication from the public to the government. Email allows messages to be sent directly to the recipient, thus facilitating more efficient information exchange, coordination and feedback between citizens and the government (C. G. Wescott, 2001). Conceptually, E-Government has many different interpretations. As per the World Bank's definition, E-Government refers to the utilization of Information and Communication Technology (ICT) by governments to improve efficiency, effectiveness, transparency and accountability in government administration (Information for Development Program [InfoDev], 2002).

Advances in Information and Communication Technology (ICT) have changed the way people live their lives. This transformation affects various sectors, including public services. The tradition of government services that sometimes felt rigid and filled with bureaucracy is now being replaced by a more flexible and user-oriented approach to e-government. With e-government, public services become available 24 hours a day, anywhere and anytime users need them. Moreover, e-government also enables efficiency in services as it no longer requires face-to-face meetings (Rokhman, 2011).

Information and communication technology (ICT) is one of the e-government concepts that holds a positive impact. It can be seen from several studies such as from (AGHAEI &

REZAGHOLIZADEH, 2017; Majeed & Ayub, 2018). It clearly shows that implementing Information and Communication Technology (ICT) has a positive impact on improving accounting systems, performance, productivity, as well as economic growth. By supporting the advancement of ICT for e-government implementation in a city, it can provide a variety of information and services, including data for research, government administrative forms and services, public policy information, employment and business opportunities, election information, tax payments, license registration or renewal, payment of fines, as well as providing feedback to government officials. Thus, by adopting e-government, the public can also actively participate in the decision-making process (Rahman et al., 2020).

E-Government practices in Asia tend to reflect the structure and ongoing reform process in each city, particularly with regard to administrative effectiveness, civic engagement, and levels of corruption. As in developed countries, e-government has not been the main driver for reform, although it has helped support ongoing reform processes. In Beijing, there is a public service system based on E-government. Beijing has a website that provides various categories of options including government services, laws and regulations, a news center, links to other government departments, and an email section. It can also ask citizens to make suggestions on the development of the capital, or criticize unsatisfactory work (C. Wescott, 2004).

This E-Government concept can also help improve services in the field of community security. There is one city in the Asian country, Seoul, implementing e-government as an improvement in the quality of security services in the community. In 2000, it established a computer crime investigation department. Computer crime investigation teams were established in local prosecutors' offices across the country. The aim is to effectively deal with increasingly technologically and tactically sophisticated offenses, as well as to assist in the investigation of wiretapping cases, to identify corruption crimes using modern computer technology. This is very effective to be implemented in all countries in the world not only in Asia, because the massive technological system at this time can be dangerous for everyone who uses technological sophistication such as social media and etc. (C. G. Wescott, 2001).

One of the cities in Indonesia, Yogyakarta, also uses the concept of smart city based on E-Government as an increase in quality services to the community. One of the E-Government concepts implemented in Yogyakarta is the existence of an application called JSS Jogja Smart Service. The Jogja Smart Service (JSS) application is a simple application that was introduced at the 71st Anniversary of the Yogyakarta City Government. The purpose of launching this application is more focused on efforts to facilitate community services in Yogyakarta. In addition, the application, which is familiarly called JSS, also serves as an addition to inform

and report emergency events outside the telephone lines. This is because Yogyakarta previously only had a conventional reporting system, thus the Government of Yogyakarta came up with the JSS innovation to simplify the reporting system (Wahyudi et al., 2022).

Artificial Intelligence (AI) as Public Service Development

Traces of the development of artificial intelligence can be identified back to the early 20th century, although the idea of it has long existed in mythology and science fiction works. Now, AI is widely used by the general public to governments in Asia and around the world (Information for Development Program [InfoDev], 2002). Artificial intelligence is a computer program equipped with algorithms that allow it to learn data and use that information to carry out human-like thought processes and actions (Heiden & Tonino-Heiden, 2021). According to Lasse Rouhianen, Artificial Intelligence is the ability of machines to use algorithms to learn from data and use what has been learnt to make decisions like humans do. AI is a system that thinks like a human, acts like a human, as well as thinks and acts rationally (N. N. Arief & Saputra, 2019).

AI has the potential to make a huge impact on how people experience and interact with the government. While AI is not the solution to all government problems, it is an effective tool to improve government efficiency. The implementation and use of AI in various Asian cities and service sectors can also be an indicator of how the public sector can utilize digital technology more broadly. The use of AI in low-risk applications can improve online services (Mehr, 2017).

AI is also widely applied in Asian cities in the service sector. Based on the service theory and superposition theory, two shopping experiments were conducted to understand customers' thoughts and feelings, to explore the different effects of three different types of online services (AI-enabled community services, manual community services, and collaborative human-machine community services) on people's interest in using them, and to analyze how human interaction in collaborative customer services affects them. Community service to AI showed a very good response by the community. However, human-machine collaborative customer service has a complex effect (Qin et al., 2022).

There is also a type of service in the city of Beijing that uses AI as a community service facilitator, by using a chatbot to respond to services to the community. The utilization of chatbots is very useful for the community as a form of service provided by the government in the city of Beijing. There is a research that shows the usefulness of conversations using artificial intelligence-based chatbots in the context of public services. The results of this study

emphasize the importance of a theoretical basis that highlights the interaction between humans and computers as well as explains the benefits of using chatbot responsive technology. This research implies that to date, the development of interactive and human-like chatbots has focused on the ability to mimic verbal, voice and visual signals from public service providers or the government. Chatbots are now very popular among the public in Beijing to facilitate questions and understanding of public services. In general, chatbots in Beijing are also used to collect information from the public and speed up response time in solving public service problems. Some web services in Beijing have chatbots based on advanced AI technology to respond to existing public service problems (Camilleri & Troise, 2023).

AI chatbots improve the quality of labor in government bureaucracies. AI chatbots can improve time efficiency, handle routine and repetitive tasks quickly and efficiently, liberate human labor to focus on more complex tasks and requiring creative thinking. Additionally, chatbots in government bureaucracy can increase productivity by automating most administrative tasks. AI chatbots help increase labor productivity by allowing them to focus on tasks that require in-depth analysis, decision-making, and more complex human interaction. Interestingly, conversational chatbot systems can also be integrated with the service user relationship management (CRM) programs to improve people's online experience (Camilleri, 2020).

Conclusion

Smart cities use ICT to improve access to services, and are gaining popularity due to technological developments and urban growth. Asian countries such as India, Singapore, South Korea and Japan have implemented the smart city concept to address urban challenges. Thorough planning and technological development are required to implement smart cities, with China and Singapore leading the way in adopting smart technology and AI for city management. Indonesia is also developing an e-Government system that uses AI to improve the efficiency of bureaucracy and public services, providing benefits such as easier access to government services and improved service quality. Researches to develop online services using AI for smart cities are underway, aiming to improve the quality of public services. E-Government utilizes ICT to manage and provide public services, emphasizing the use of ICT infrastructure for public service management. Asian countries have made significant progress in e-government by using ICT to improve government efficiency, provide user-friendly services, and improve public access to information. Asia consistently scores high in e-government and digital surveys, yet still faces challenges in producing a skilled IT workforce.

IT is critical to the implementation of e-government, which requires a sufficient number of skilled government employees to provide effective and efficient public services.

The emergence of smart cities, driven by advancements in Information and Communication Technology (ICT), has garnered widespread attention as a promising solution to urban challenges. Countries across Asia, including India, Singapore, South Korea, and Japan, have embraced the smart city concept to address the complexities of urbanization. Notably, China and Singapore have taken significant strides in leveraging smart technology and Artificial Intelligence (AI) for efficient city management. In Indonesia, the development of an e-government system incorporating AI signifies a commitment to enhance the bureaucratic efficiency and public service delivery. This initiative promises easier access to government services and improves service quality for citizens. Ongoing research efforts aim to harness AI to further enhance online services, thereby elevating the overall quality of public services in smart cities. While Asian countries have made remarkable progress in e-government implementation, challenges persist, particularly in cultivating a skilled IT workforce. The success of e-government hinges on the availability of proficient government employees capable of delivering effective and efficient public services. Furthermore, the scope of the analysis may be limited by the availability and coverage of data within VOS Viewer. It may not encompass the entirety of research conducted in Asian countries on e-government and smart cities, potentially leading to gaps in understanding and interpretation. Hence, future research could consider employing complementary methods such as interviews with experts, or surveys to gain a more comprehensive understanding of the topic. Beside, further research also warranted to explore the multifaceted applications of AI in public services, including the deployment of chatbots for rapid response to public inquiries and issues. Comparative studies assessing the effectiveness of e-government systems across different levels of government, from central to local, are essential. Such studies should delve into the factors influencing the success of e-government implementation and its impact on enhancing the efficiency, effectiveness, and responsiveness of public services.

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