

How is Information and Communication Technology used in the Indonesian Government? A Scientometric Analysis

Herman Lawelai^{1*}, Misran², Elaine Baulete³, Christine B. Tenorio⁴, Velandani Prakoso⁵

¹Department of Government Studies, Universitas Muhammadiyah Buton, Betoambari Street, Baubau City, 93724, Indonesia

²Department of Public Administration, Universitas Gadjah Mada, Bulaksumur Street, Yogyakarta City, 55281, Indonesia

³Department of Political Science, Mindanao State University-Iligan Institute of Technology, Iligan City, 9200, Philippines

⁴Department of Public Administration, Bukidnon State University, Fortich St. Street, Malaybalay City, 87001, Philippines

⁵Department of Information Systems, Universitas Siber Muhammadiyah, HOS Cokroaminoto Street, Yogyakarta City, 55183, Indonesia.

*Corresponding author: hermanlawelai92@gmail.com

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Abstract

Abstract: This study aims to analyze publication trends related to the ICT Government in Indonesia with a scientometric approach. This study uses data analysis methods from Scopus with RStudio, VOSviewer, and CiteSpace applications to visualize and analyze publications. The findings show that Indonesian authors dominate ICT Government research with 172 documents, while the contributions of authors from Malaysia, the United States, and the Netherlands provide an important international perspective. The main research topics include e-government, smart cities, and sustainable development. The findings demonstrate the role of ICTs in improving government efficiency, transparency, and civic engagement. However, publications declined in 2022, possibly due to changing research priorities or the impact of the COVID-19 pandemic. The implication of this study is the importance of international collaboration and improved technological infrastructure. The limitation of this study is the limited data that is only taken from Scopus.

Abstrak: Penelitian ini bertujuan untuk menganalisis tren publikasi terkait TIK Pemerintah di Indonesia dengan pendekatan scientometric. Penelitian ini menggunakan metode analisis data dari Scopus dengan aplikasi RStudio, VOSviewer, dan CiteSpace untuk memvisualisasikan dan menganalisis publikasi. Temuan menunjukkan bahwa penulis Indonesia mendominasi penelitian TIK Pemerintahan dengan 172 dokumen, sementara kontribusi penulis dari Malaysia, Amerika Serikat, dan Belanda memberikan perspektif internasional yang penting. Topik penelitian utama meliputi e-government, kota pintar, dan pembangunan berkelanjutan. Temuan-temuan tersebut menunjukkan peran TIK dalam meningkatkan efisiensi, transparansi, dan keterlibatan masyarakat. Namun, publikasi menurun pada tahun 2022, mungkin karena perubahan prioritas penelitian atau dampak pandemi COVID-19. Implikasi dari penelitian ini adalah pentingnya kolaborasi internasional dan peningkatan infrastruktur teknologi. Keterbatasan dari penelitian ini adalah terbatasnya data yang hanya diambil dari Scopus.

Introduction

Information and Communication Technology (ICT) is a broad term for information technology that emphasizes unified communications and the integration of telecommunications and computers, as well as the necessary enterprise software, middleware, storage, and audiovisual systems that enable users to access, store, transmit, and manipulate data (Szarek-Iwaniuk & Senetra, 2020). Since the 1980s, the expression "information and communication technology" has been used in academic studies. However, the word has been gaining popularity since 1997, when Dennis Stevenson's report to the UK government was published, and later in the redesigned national curriculum for England, Wales and Northern Ireland in 2000 (Devi et al., 2021). ICT, as a broad and evolving term, focuses on the electronic storage, collection, distribution and modification of certain goods. In short, ICT refers to the use of today's technology and equipment to transform the world into a digital one.

ICT is now an important element of everyday life, including education, economy, commerce, and even government. So far, ICT has more of a role as a catalyst for all sectors, not as a facilitator or instrument to carry out operations and procedures. In both rich and developing countries, ICTs in government are used to promote transparency of governments, their duties, and public services. ICT plays a role in reducing bureaucracy in the government sector by increasing efficiency and effectiveness not only in goods and services but also in organizational and administrative structures.

Building an interoperable data architecture requires an understanding of several key challenges, such as the difficulty of collecting accurate and reliable data, limited technological capabilities, complex data ownership and disclosure policies, issues of confidentiality, privacy, and the economic value of information, as well as the costs of disclosing information. To overcome these difficulties, developers must ensure data quality, integrity and security, establish information policies that balance commercial interests with openness and provide appropriate governance structures to complement technology design to ensure fair and proper use of systems (Sayogo et al., 2015).

Bureaucratic reform is an effort to improve the system of structuring matters concerning the institutional, commercial, and human resources components of the apparatus. Human resources are one of the most important components that business cannot even separate. Employee capacity building has been successfully implemented in one-stop integrated services; this is influenced by various elements such as education, training, and assignments; workers understand their duties in carrying out tasks assigned by superiors and provide services to the community. The behavior of the apparatus must be changed so that it is oriented towards efficiency and quality of work, while prioritizing the interests of the general public and social justice (Yusriadi et al., 2019). Properly crafted rules can support digital platforms and web-based applications, as well as increase the use of e-wallet in underdeveloped countries (Yang et al., 2021).

New knowledge of external change, whether environmental or organizational, is often the catalyst for such targeted engagement. Multiple perspectives or stakeholders are also involved in the action, and their concerns are often interrelated (Inan et al., 2018). To be useful, information must be collected and provided to customers in a straightforward manner, right at their fingertips. Consumer confidence in information about sustainable practices is strongly influenced by information showing support from government agencies and non-profit groups (Zhang et al., 2016).

ICTs can be used to promote openness and accountability in all governance and development processes. The aim is to develop a reporting system and improve the performance of government agencies, increase public access to information about the performance of government agencies, adopt e-Government to assist contemporary bureaucratic management and improve the implementation of open government in all institutions. The aim of adopting e-Government is to enable simple, efficient, transparent, and integrated governance and development of business operations through strategy implementation. Furthermore, some of these approaches include strengthening e-Government policies that regulate institutions, strengthening integrated e-Government systems and infrastructure, improving/strengthening electronic procurement systems, and developing electronic catalog systems, as well as improving ICT-based archiving systems. As a result, better governance will be achieved through ICT.

To check the maturity of ICT Government processes, various processes by agencies and conduct a series of meetings/discussions to help improve and model the ICT contract planning process (Canedo et al., 2020). In the last 15 years, the role of ICT in business has changed dramatically. The increasing relevance of ICT, which is seen as an important lever to support company operations, increase the effectiveness of goods and services, and enable significant strategic and organizational change, affecting many companies from different sectors and geographic regions (Balocco et al., 2013). Today, governments around the world are using ICTs to build more transparent, efficient, and inclusive relationships with their citizens. Due to technological and socio-economic conditions, the new open government paradigm differs between countries (Alderete, 2018). In fact, the Indonesian government has only used the notion of governance irregularly. As a result, the Indonesian government has made great strides to facilitate growth in all areas, especially public services. The concept of governance can be used to purposely provide better public services. As a result, when debating public governance in Indonesia, the subject of public service will continue to emerge (Kristin Monim et al., 2022).

After defining the term ICT Government, the question arises of how and in what ways are these two ideas interrelated and what is the position of current research on ICT Government in Indonesia? Since ICT is related to the use of today's technologies and tools, governments in many countries are starting to use these tools to make public services more efficient and effective in serving the interests of the people. This article focuses on how the trends and characteristics of journals, authors, keywords, and topics related to ICT Government research in developing countries such as Indonesia.

Research Method

This study uses a bibliometric study to explain the publication of research results related to the ICT Government in Indonesia which is indexed by Scopus. This study uses two analytical methods, namely analyzing the search results of Scopus indexed publications on the Scopus database and analyzed using the Rstudio, VOSviewer, CiteSpace application. This study is based on a literature evaluation conducted using the Scopus database, which is one of the largest journal databases in the world and can provide scientific and academic information (Singh et al., 2021; Subandi et al., 2022). The articles used in this literature review consist of 252 journals obtained from the Scopus database.

This study visualizes and analyzes data using Rstudio, VOSviewer, CiteSpace analysis in the form of bibliometric maps (Donthu et al., 2021). Rstudio, VOSviewer, CiteSpace can also generate maps of publications or journals from shared citation networks, as well as keyword maps from networks. In addition, the Rstudio, VOSviewer, CiteSpace application can also generate bibliometric maps in studies based on the main themes and data (Nurmandi et al., 2021).

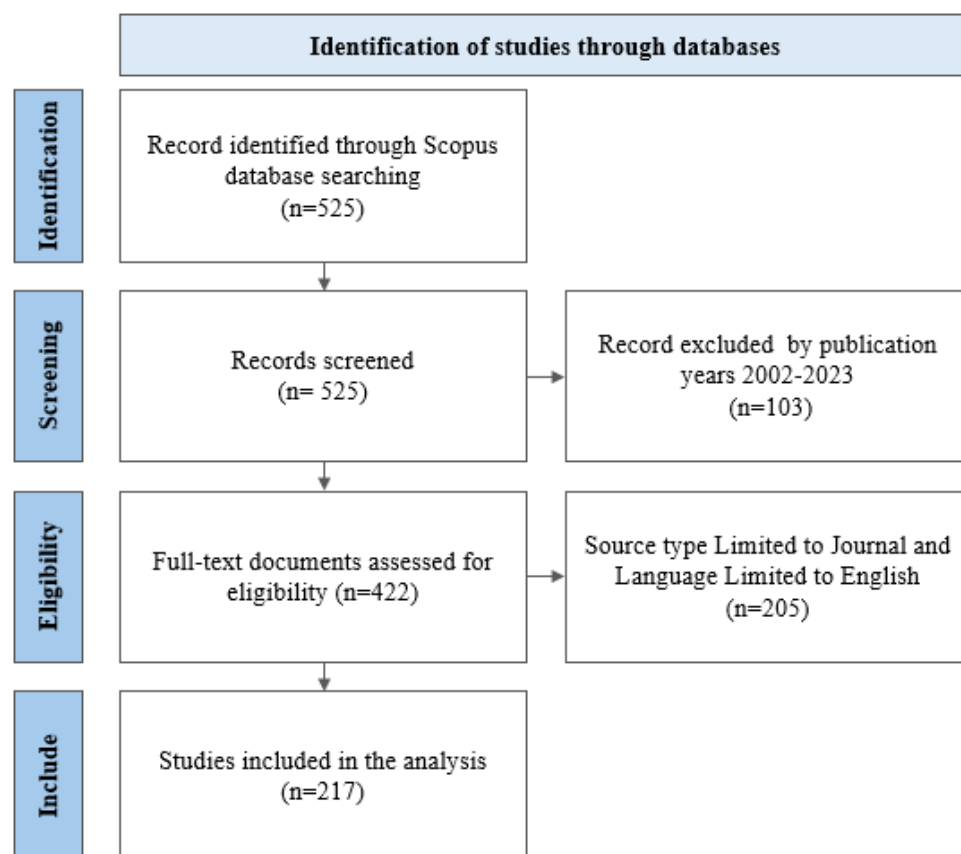


Figure 1. Data analysis process

Results and Discussion

A review of data from the Scopus database indicates that the majority of research related to ICT government in Indonesia is in the form of articles (95.6 percent), with a relatively low proportion of reviews (4.4 percent). This indicates that research in this domain is primarily constituted by empirical and analytical studies, as opposed to literature reviews. The research encompasses a comprehensive range of topics, including journal trends, author characteristics, keywords, and related subjects that exemplify the extensive scope of ICT research in government. From 2014 to 2021, the number of journal documents in the Scopus database exhibited a notable increase. This increase reflects a growing interest and attention in the application of ICT in government in Indonesia, which aligns with the rapid development of technology and the need to modernize public services.

However, there has been a decline in publications in 2022. This decline could be attributed to a number of factors, including shifts in research priorities, limited funding, or even the impact of the COVI-19 pandemic, which may have affected researchers' ability to conduct and publish their research. Further analysis could examine the correlation between these publication trends and government policies that encourage research and innovation in ICT government.

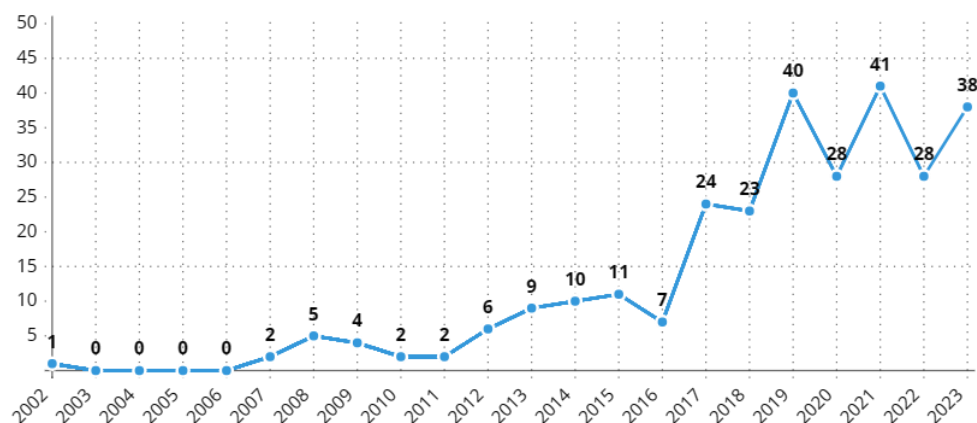


Figure 2. Number of publication documents

Geographical distribution ICT government research in Indonesia

Research on ICT Government is a topic that has been carried out in the last eight years by various researchers from various countries, especially studies in Indonesia with its own characteristics that invite researchers to conduct research and publish it in journals of international repute and indexed by Scopus, as shown in Figure 3.



Figure 3. Top 10 document by country

Literature on the ICT government in Indonesia reveals a preponderance of research conducted by Indonesian authors, with 172 documents identified. This observation reflects the heightened focus and attention of local academics on this topic. The preponderance of documents authored by Indonesian scholars underscores the imperative for the advancement of information and communication technology within the Indonesian government sector, particularly with regard to enhancing efficiency, transparency, and the quality of public services. Conversely, the contributions of authors from other countries, including Malaysia (23 documents), the United States (13 documents), and the Netherlands (9 documents), though fewer in number, provide a significant global perspective, indicating international attention to the implementation of ICT government in Indonesia. The involvement of authors from Thailand, Mexico, and the Philippines, though modest in number, demonstrates that developing countries in Asia and Latin America are also engaged with analogous concerns. This underscores the possibility of cross-country collaboration to disseminate experiences and best practices in the advancement of ICT in government. The involvement of developed countries, including the United States and the United Kingdom, offers opportunities to adopt sophisticated technologies and innovative strategies for implementing the ICT government in Indonesia. This demonstrates that the subject of ICT government in Indonesia is not only of domestic significance but also has global relevance, paving the way for further collaboration to expedite digital transformation in government.

Publication vanues ICT government research in Indonesia

Based on the analysis of the search results on the Scopus database, it was found that the journals related to ICT Government in the Scopus database consisted of 117 journals. However, if analyzed using VOSviewer, based on a minimum of five documents, it was found

ten popular journals that became author references related to ICT Government as shown in Table 1.

Table 1. Themes grouped in clusters

Journal	Document
IOP Conference Series Earth and Environmental Science	10
ACM International Conference Proceeding Series	9
Lecture Notes in Networks and Systems	8
E3s Web of Conferences	7
IOP Conference Series Materials Science and Engineering	7
AIP Conference Proceedings	6
Journal of Physics Conference Series	6
Journal of Theoretical and Applied Information Technology	5
Sustainability Switzerland	5
International Journal on Advanced Science Engineering and Information Technology	4

Source: Data processed 2024

Table 1 shows that the journals used by the authors to publish the results of their research in Indonesia on ICT Government have been in various journals indexed by Scopus. Sustainability (Switzerland) dominates with 28 documents, International Journal of Emerging Technologies in Learning (11 documents), Universal Journal of Educational Research (10 documents), Humanities and Social Sciences Reviews, and International Journal of Data and Network Science (9 documents each), Problems and Perspectives in Management (6 documents), International Journal of Evaluation and Research in Education, Jurnal Ilmu Sosial dan Politik, Journal of Communication Malaysian Journal of Communication, Public Policy, and Administration, and Webology (5 documents each).

The journals that are most frequently cited are shown in Table 2.

Table 2. Top 10 journals and publications on Scopus by cites

Journal	Document	Cites
International Journal of Emerging Technologies in Learning	11	277
Government Information Quarterly	3	123
Sustainability (Switzerland)	17	73
Transforming Government: People, Process and Policy	3	32
Information Technology and Management	1	25
International Journal of Disaster Risk Reduction	2	25
Journal of Social Sciences Research	1	23
Journal of Information Technology Education: Research	1	22
World Journal on Educational Technology: Current Issues	1	17
Public Policy and Administration	3	17

Source: Data processed 2024

Table 2 shows that there are the top 10 most frequently cited journals along with the number of documents. International Journal of Emerging Technologies in Learning dominates with 11 documents, 277 citations, Government Information Quarterly (3 documents and 123 citations), Sustainability (Switzerland) (17 documents and 73 citations),

Transforming Government: People, Process and Policy (3 documents and 32 citations), Information Technology and Management (1 document and 25 citations), International Journal of Disaster Risk Reduction (2 documents and 25 citations), Journal of Social Sciences Research (1 document and 23 citations), and World Journal on Educational Technology: Current Issues (1 document and 17 citations).

Authorship ICT government research in Indonesia

Based on VOSviewer analysis based on a minimum frequency of three documents with the number of publications, 12 popular authors have documents related to ICT Government research in Indonesia in Scopus indexed journals. The authors published articles in different international journals related to ICT Government research in Indonesia, as shown in Figure 3. below.

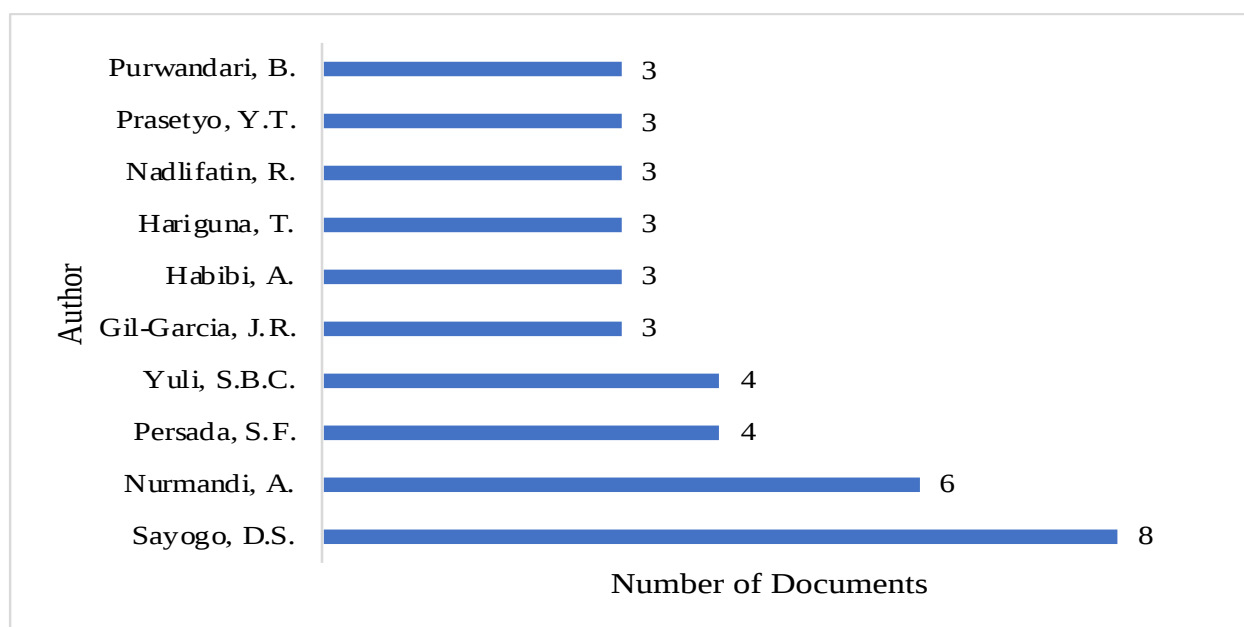


Figure 4. Top 10 number of authors by document

Figure 4 above shows the top 10 authors with ICT Government research publications in Indonesia. Sugayo, D.S. (8 documents), Nurmandi, A. (6 documents), Parada, S.F. and Yuli, S.B.C. (4 documents each), Gil-Garcia, J.R., Habibi, A., Hariguna, T., Nadlifatin, R., Prasetyo, Y.T., and Purwandari, B. (3 documents each). The author's institutional affiliation comes from different universities as shown in Figure 5. below.

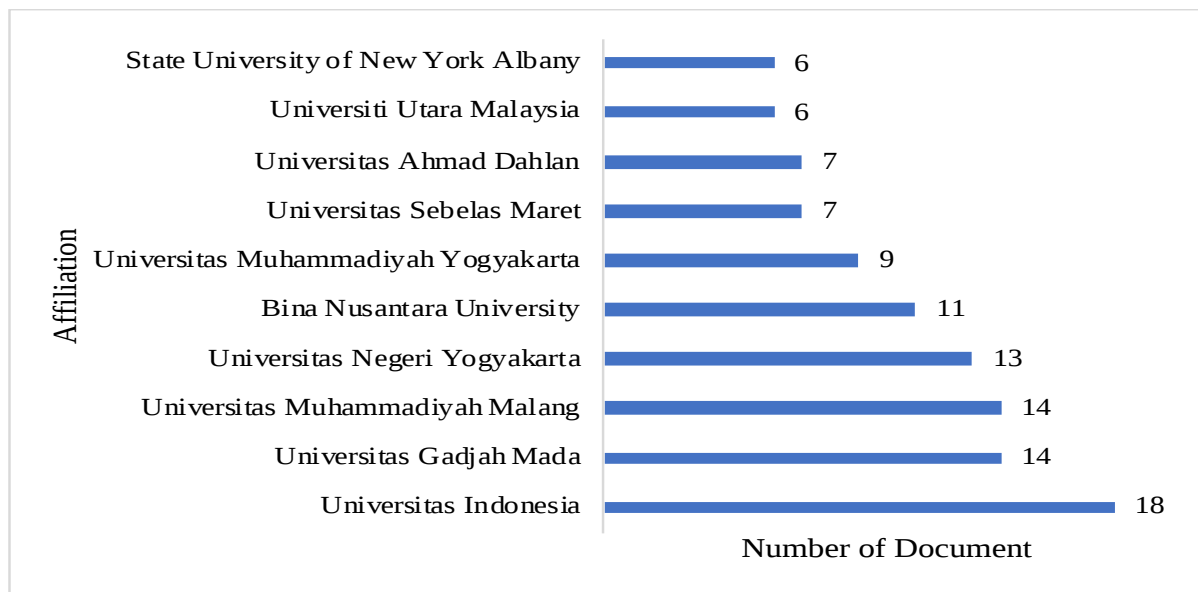


Figure 5. Top 10 number of affiliation institutional by document

Figure 5 above shows the top 10 author institutional affiliations with ICT Government research publications in Indonesia. Universitas Indonesia (18 documents), Universitas Gadjah Mada, and Universitas Muhammadiyah Malang (14 documents each), Universitas Negeri Yogyakarta (13 documents), Bina Nusantara University (11 documents), Universitas Muhammadiyah Yogyakarta (9 documents), Universitas Sebelas Maret, and Universitas Ahmad Dahlan (7 documents each), Universiti Utara Malaysia and State University of New York Albany (6 documents each).

Based on the VOSviewer analysis based on the frequency of at least one document with a minimum number of 17 citations, 15 popular articles with various citations were obtained, as shown in Table 2. which shows the number of authors with one document in the Scopus database based on a minimum of ten citations. Thus 10 authors have popularity in ICT Government research in Indonesia in the Scopus indexed journal.

Table 2. Top 10 journals and publications on Scopus by cites

Title	Authors	Cites	Year	Source
Big data emerging technology: Insights into innovative environment for online learning resources	Huda, M., Maseleno, A., Atmotiyoso, P., Mustari, M.I., Basiron, B.	159	2018	International Journal of Emerging Technologies in Learning
Government inter-organizational information sharing initiatives: Understanding the main determinants of success	Gil-Garcia, J.R., Sayogo, D.S.	72	2016	Government Information Quarterly
Understanding the generation z behavior on D-learning: A Unified Theory of Acceptance and Use of Technology (UTAUT) approach	Persada, S.F., Miraja, B.A., Nadlifatin, R.	40	2019	International Journal of Emerging Technologies in Learning
Smartphone habits and behaviors in supporting students self-efficacy	Razzaq, A., Samiha, Y.T., Anshari, M.	36	2018	International Journal of Emerging Technologies in Learning
Does citizen coproduction lead to better urban services in smart cities projects? An empirical study on e-participation in a mobile big data platform	Allen, B., Tamindael, L.E., Bickerton, S.H., Cho, W.	31	2020	Government Information Quarterly
Challenges and requirements for developing data architecture supporting integration of sustainable supply chains	Sayogo, D.S., Zhang, J., Luna-Reyes, L., Pardo, T.A., Andersen, D.F.	25	2015	Information Technology and Management
Pushing toward a more personalized MOOC: Exploring instructor selected activities, resources, and technologies for MOOC design and implementation	Bonk, C.J., Zhu, M., Kim, M., Sabir, N., Sari, A.R.	24	2018	International Review of Research in Open and Distance Learning
Bureaucratic reform to the human resouces: A case study on the one-stop integrated service	Yusriadi, Sahid, A., Amirullah, I., Azis, A., Rahman, A.A.	23	2019	Journal of Social Sciences Research
Cashless transactions: A study on intention and adoption of e-wallets	Yang, M., Al Mamun, A., Mohiuddin, M., Nawi, N.C., Zainol, N.R.	22	2021	Sustainability (Switzerland)
Exploring teacher perceptions and motivations to ICT use in learning activities in Indonesia	Mahdum, M., Hadriana, H., Safriyanti, M.	22	2019	Journal of Information Technology Education: Research
Developing a decision support system for Disaster Management: Case study of an Indonesia volcano eruption	Inan, D.I., Beydoun, G., Pradhan, B.	22	2018	International Journal of Disaster Risk Reduction
Strengthening institutional-based trust for sustainable consumption: Lessons for smart disclosure	Zhang, J., Liu, H., Sayogo, D.S., Picazo-Vela, S., Luna-Reyes, L.	19	2016	Government Information Quarterly
How elementary school teachers organized online learning during the covid-19 pandemic?	Herwin, H., Hastomo, A., Saptono, B., Ardiansyah, A.R., Wibowo, S.E.	17	2021	World Journal on Educational Technology: Current Issues
Does social media transform city government? A case study of three	Roengtam, S., Nurmandi, A.,	17	2017	Transforming Government: People, Process and Policy

ASEAN cities: Bandung, Indonesia, Iligan, Philippines and Pukhet, Thailand	Almarez, D.N., Kholid, A.
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Source: Data processed 2024

Table 1 Shows that the most frequently cited documents providing ideas on big data in the ICT sector expand prospective research lines on online learning and big data integration through promising materials that can be personalized for each user in online learning based on the context and behaviour of the internet users. Based on a significant number of citations, this document is very influential for global researchers. However, relatively few recently released publications have had any influence on related studies. Emerging big data technology with analytical processes provides special advantages for changing information patterns used in innovative learning environments to improve in development of learning resources in support of easy and convenient implementation (Huda et al., 2018).

Subject area ICT government research in Indonesia

Table 3. Document by subject area

Subject area	Document
Social Sciences	252
Computer Science	43
Environmental Science	36
Energy	33
Business, Management and Accounting	32
Economics, Econometrics and Finance	31
Arts and Humanities	27
Engineering	19
Decision Sciences	17
Earth and Planetary Sciences	8
Agricultural and Biological Sciences	6
Mathematics	6
Psychology	4
Medicine	3
Nursing	3
Health Professions	2
Immunology and Microbiology	2
Biochemistry, Genetics and Molecular Biology	1
Neuroscience	1

Source: Data processed 2024

Table 3 shows that there are research subjects and publications containing documents on ICT Government in Indonesia. Fields of study such as Social Sciences are fields of interest for researchers with 252 documents, the most from other fields of study. Fields of study such as Social Sciences are one of the fields of study that contain many studies and research on ICT Government issues in Indonesia. Although dominant, the data above also shows that ICT Government studies need to be understood in various contexts by observing other fields of study. The complexity of ICT Government issues in Indonesia can be observed in other fields to find ideas and the basis for developing ICT Government, and this is also based on many

researchers in other fields, especially the field of Social Sciences. In the social sciences, many researchers initiate ideas about the urgency of ICT Government by looking at other fields of study. This trend is observed that researchers in the field of study such as Social Sciences need documents or research results in other fields to build ideas and analysis.

Mapping of ICT government publications and research topics in Indonesia

Based on the VOSviewer analysis, in the analysis of the number of occurrences of the keyword menu, 1299 keywords were found. After filtering using a minimum frequency of 3, 64 keywords have been obtained that have met the threshold. Then from the 64 keywords, there is a relationship between one node and another: The closer the distance from one node to another, the higher the relationship between the nodes.

Table 4 shows 64 keywords, of which with a minimum frequency of 10 occurrences are Indonesia (46 Occurrences), Covid-19 (20 Occurrences), social media, and sustainability (14 Occurrences each), e-learning (12 Occurrences), and smart cities (10 Occurrences).



Figure 6. Wordcloud by topic occurrence

Figure 6 shows the most common themes in research related to ICT government in Indonesia. The word 'Indonesia' dominates, reflecting the focus of the research on the local context, namely the application of information technology in the government sector in Indonesia. In addition, the words "e-government" and "smart city" are prominent, confirming that the main focus of the research is on the implementation of e-government to modernise public services and develop technology-enabled smart cities. Words such as 'government data processing', 'information systems' and 'information and communication technology' are also quite prominent, indicating the importance of data processing and

concepts of "smart city" and "sustainable development" illustrate how ICTs are being utilized to facilitate sustainable development and more intelligent urban governance. Research has also identified obstacles to ICT adoption, including sufficient infrastructure and training for government personnel. Clusters such as "ICT development strategies" and "potential digital health interventions" demonstrate efforts to develop more comprehensive and innovative ICT strategies to support various sectors, including health.

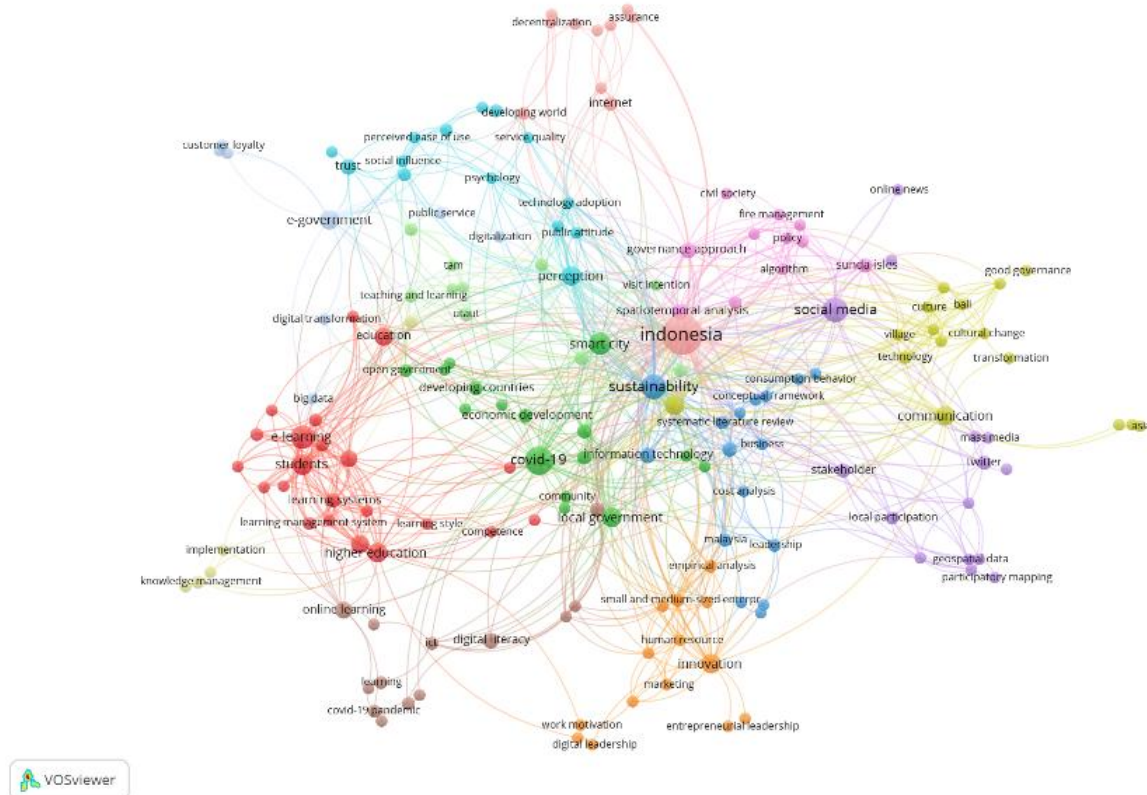


Figure 8. Analysis of co-accurance network visualization of ICT government in Indonesia

Figure 6 depicts the clusters in each of the problem areas investigated. This shows that they have a close bond. The timeline-based approach is the next method for displaying bibliometric networks. The time-based method, in contrast to the distance-based and graph-based techniques, implies that each node in the bibliometric network can be linked to a specific point in time as in Figure 7. Since a publication can be easily linked to a particular moment in time based on the date of its publication, the timeline-based technique is ideal for displaying network publications. There are two dimensions in a timeline-based representation, one of which is used to represent time. Other dimensions may be used to show the interconnectedness of nodes. The exact instance in which a node is associated determines its placement in the time dimension. The relationship of a node to other nodes can be used to conclude its placement in other dimensions (Van Eck & Waltman, 2014).

The development of ICT government in Indonesia is relatively simple and lagging other ASEAN countries. The e-Government index in government institutions is off the mark. There is a disconnect between the e-Government index and central institutions, as well as between the provincial and district/city governments. The inhibiting factors of e-Government are: (1) Inadequate regulation to encourage and direct e-Government; (2) lack of data integration; (3) gaps in the availability of ICT infrastructure between regions; (4) limited ICT skills; and (5) bureaucratic culture and leadership ([Aminah & Saksono, 2021](#)).

Comparative research between Indonesia, the Philippines, and Thailand shows that the City of Bandung (Indonesia) has achieved considerable engagement by engaging its citizens in the day-to-day operations of the city. Meanwhile, Iligan City (Philippines) and Phuket Town (Thailand) are currently undergoing internal organizational transformation. The role of top and middle leaders, legal standing for social media use, policy framework, and internal change management are all important aspects of social media use in the three cities ([Nurmandi et al., 2018](#)).

The use of social media has little effect on the organization's internal procedures. In addition, social media is used as a platform for citizen-government dialogue ([Lawelai et al., 2022](#); [Sadat et al., 2022](#)). Only used to disseminate information to the public; social media seems to be used only to obtain information from citizens, not to involve them in decision making ([Roengtam et al., 2017](#)). In addition, individuals prefer information that includes photos and videos, which seem to dominate local government posts and tweets ([Santoso et al., 2020](#)).

Sustained use intentions are negatively affected by perceived harm and positively by subjective norms, perceived values, and beliefs among Millennials. Furthermore, perceived harm had a small and negative direct effect on continued use intentions, whereas subjective norms, perceived values, and beliefs had a direct beneficial impact ([Rahmayanti et al., 2022](#)). The variables identified in the TOE framework can affect the implementation of e-Government but have not shown public accountability. The implementation of e-Government can have a good and significant influence on accountability. Consequently, it can be shown that increased accountability can be achieved by maximizing e-Government in each area ([Defitri et al., 2020](#)).

After adjusting for other variables, the e-participation of citizens in providing service feedback correlates well with the level of permission to request urban services in the sub-district service unit. The magnitude of the effect of e-participation on service performance varies according to the type of city service. When opposed to simple regular services, electronic engagement has a much higher effect on complex situations that may involve multiple institutions ([Allen et al., 2020](#)).

Any new initiatives in the provision of public services, especially those utilizing ICT, must be effectively communicated, and consulted with the implementing unit. Furthermore, for the project to be sustainable, it must be accompanied by an appropriate set of policies ([T. Rachmawati & Fitriyanti, 2021](#)). As a policy maker, the government should offer financial

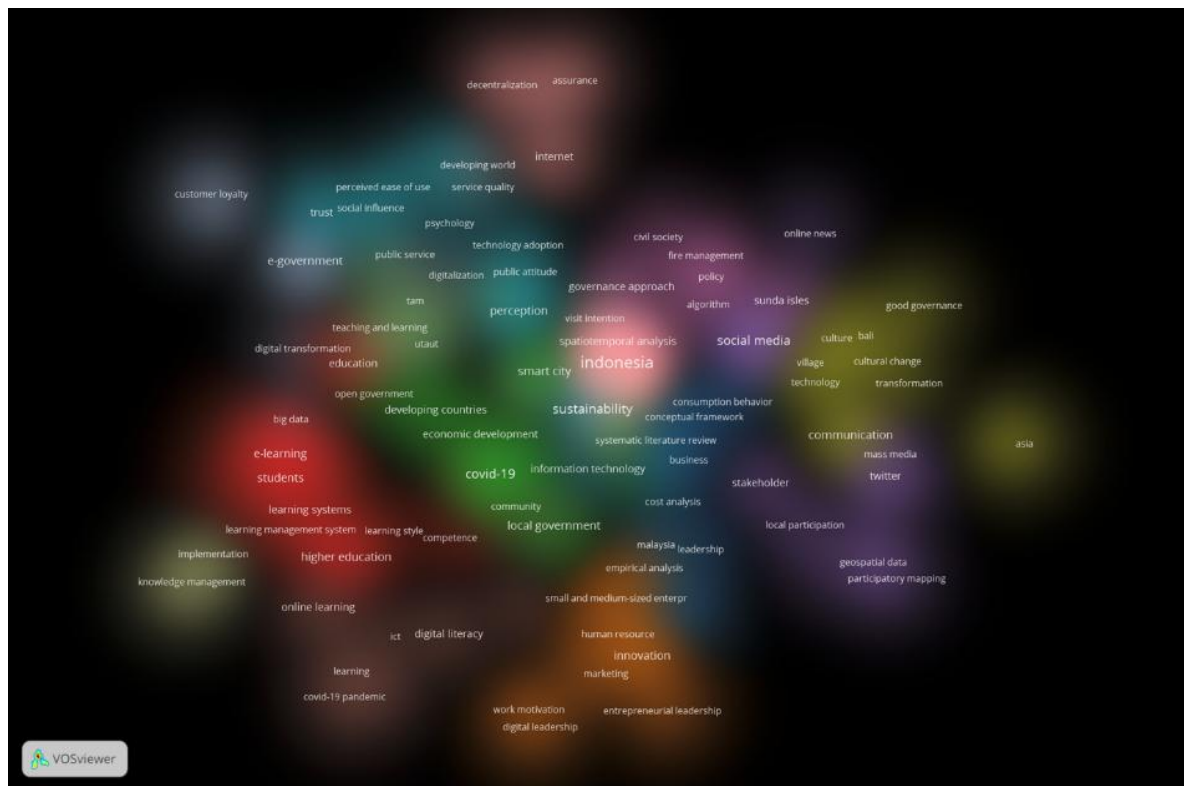


Figure 8. Analysis of co-occurrence density visualization of ICT government in Indonesia

Figure 8 shows the level of research, showing that the more intense the color appears, the more research is carried out. Using this information, we can follow the progress of research on ICT Government in Indonesia. Other scholars, for example, have not conducted analysis and mapping of ICT Government research in Indonesia. Therefore, the researcher analyzed and mapped with visualization using VOSviewer, so that it could contribute to the development of ICT Government literature. In previous ICT Government research in Indonesia, there are keywords that often appear, one of which is the keyword COVID-19. It is undeniable that public services during the COVID-19 pandemic require technological assistance so that various community activities are assisted without direct interaction.

With the existence of social capital and mutual trust as well as the growth of cooperation between the government and the community, the government and the community can work together to get out of the crisis. The City Government has demonstrated strong responsiveness, supported by cross-stakeholder coordination and communication, increasing trust in the government, which is critical for community compliance with social mobility restrictions (Wahyudi et al., 2021). The Indonesian government does not have adequate response tools in the event of a virus outbreak, is not prepared to communicate with the international community in the event of an outbreak, and does not have concerted action to be taken between the central government and secondary local governments in managing their response. (Setiawana et al., 2021).

To manage the crisis effectively, the provincial government coordinates with various stakeholders of the local government, army, police, and universities, so that control and supervision is the strongest aspect of local government regulation in response to a crisis (Mustari et al., 2021). Risk communication related to health standards and services in times of crisis as a campaign to make Jakarta transportation users aware of their surroundings. Furthermore, this function is in the form of preventing COVID-19 by providing disinfectant boxes, using hand sanitizers, and providing health education, and information services (Purnomo et al., 2021). Each agency contains innovative solutions to the COVID-19 epidemic. They demonstrated originality and local innovation adapted to the difficulties encountered in the five case studies. The use of ICT-based applications in various public functions as part of implementing smart cities is an example of this innovation (R. Rachmawati et al., 2021). Of course, by implementing proper health practices, the home service system is chosen as an alternative method to live in these circumstances. During the COVID-19 period, this system was designed with a mobile application as a tool to place orders and maintain customer service schedules (Windarto et al., 2021).

In addition, it seems that previous research on ICT Government in Indonesia has evaluated the use of technology in online-based learning processes. Based on their generation, the younger generation optimizes their learning capacity. Generation Z is a generation that is still in high school and college, making the internet of things dominate this generation. Most of the tested factors showed a substantial and positive relationship. The facilitation condition factor was found to be the most influential element influencing the behavioural intention of Generation Z (Persada et al., 2019).

Online learning is based on a solid curriculum that includes a choice of basic abilities that are considered very important to be given to students (Herwin et al., 2021). Smartphones can help students develop their confidence and understanding of mobile learning for a variety of reasons, including internal and external influences. When students engage in mobile learning, they evaluate their performance, achievements, and experiences to build confidence about their ability to participate in comparable activities. Meanwhile, comparable activities are limited by smartphone habits and level of online knowledge (Razzaq et al., 2018). Teachers have positive attitudes and desires towards the use of ICT in learning activities. However, they continue to face a number of challenges related to infrastructure and technological skills (Mahdum et al., 2019). Without additional metrics such as in-depth interviews, focus groups, and course observations, it is impossible to properly capture all the types of MOOC personalization used by the instructor or design team (Bonk et al., 2018).

Conclusion

The findings of this study indicate that research about ICT in the Indonesian government sector is predominantly authored by local scholars, as evidenced by the 172 documents identified in the Scopus database. This demonstrates Indonesian academics' significant interest in applying information and communication technology in the government sector. Furthermore, the input of international authors from Malaysia, the United States, and the

Netherlands offers a global perspective that validates the international relevance of ICT implementation in the Indonesian government. This research demonstrates a positive trend of increasing publications from 2014 to 2021, which coincides with the rapid development of technology in the public sector. However, there was a decline in 2022, which is thought to be influenced by changes in research priorities and the impact of the COVID-19 pandemic.

Theoretically, this research reinforces that ICT is pivotal in enhancing public services' transparency, efficiency, and effectiveness. Implementing e-government systems can facilitate the reform of bureaucratic structures and reduce the number of administrative barriers encountered in the governance context. Furthermore, this research proposes the implementation of more integrated and sustainable e-government policies to improve governance in Indonesia. Moreover, the findings offer valuable insights regarding potential avenues for international collaboration to compete for best practices in developing ICT-enabled governance, particularly between developing and developed countries. Such partnership could prove instrumental in accelerating digital transformation in the public sector.

It should be noted, however, that this research is not without limitations. It should be noted that the analysis is based solely on documents indexed in Scopus, which may result in the exclusion of contributions from other publications not included in the database. Furthermore, using bibliometric methods with tools such as VOSviewer, Rstudio and CiteSpace merely offers an overview, failing to provide an in-depth analysis of the content of each publication. It is therefore recommended that further research be conducted to explore the practical aspects of ICT government implementation at various levels of government and its impact on public services and public satisfaction in greater detail. It would be beneficial for future research to consider qualitative approaches that could provide a more comprehensive understanding of the challenges and opportunities associated with the implementation of ICT in the public sector.

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