BIBLIOMETRIC COMPUTATIONAL MAPPING ANALYSIS OF PUBLICATIONS ON OFFICE CLOUD COMPUTING USING VOSVIEWER

Abi Sopyan Febrianto, Resti Indriarti, Riske Faldesiani, Dian Addinna
Faculty of Economics and Business Education, Universitas Pendidikan Indonesia, Jalan Dr. Setiabudi No.229
E-mail: abisopyan@upi.edu; restiarti@upi.edu; riskefaldesiani@upi.edu; dian.addinna@upi.edu

ABSTRACT
This study aims to examine the development of office cloud computing research through a bibliometric approach with computational mapping analysis using VOSviewer. The Publish or Perish reference manager application was used to obtain the article data from the Google Scholar database. The title and abstract of the article are used to guide the search process by referring to the keyword “office cloud computing”. Discovered 997 relevant articles that Google Scholar has indexed from 2013 to 2023. According to the findings, office cloud computing research can be broken down into three categories: cloud computing, cloud, and office. There are 274 links with the term "cloud computing " and a total link strength of 3951. The term "cloud" has 272 links with a total link strength of 3841. While the term "office" has 253 links with a total link strength of 1731. The analysis of the development of publications from 2023 to 2023 results reveals frequent fluctuations. It went from 127 studies in 2013 to 134 in 2014. From 2014 to 2020, there were research fluctuations (sequentially 134, 103, 113, 94, 95, 96, 94). There was a decrease from 94 to 18 between 2020 and 2023. In the meantime, 127 studies on popular office cloud computing were conducted in 2013. Using VOSviewer, we counted the number of articles on office cloud computing and its connection to other fields. The findings of this research analysis may serve as a foundation for additional material-related research.

Key words: bibliometric; computational mapping analysis; office cloud computing; vosviewer

INTRODUCTION

Cloud computing has become one of the most significant innovations in the world of information technology in recent years. This has changed the way companies and individuals access, store and process data, and provide services over the internet. This concept allows users to use highly scalable and manageable computing resources, such as servers, storage, and software, without having to own their own physical infrastructure. In a business context, cloud computing offers a variety of benefits, including reduced initial investment costs in hardware and infrastructure, increased flexibility, and scalability. Companies can easily organize computing resources according to their needs, and users can access applications and data from anywhere with internet connection (Zulkifli et al., 2023). Cloud computing is often used in office environments, this term is called office cloud computing.

The term office cloud computing, also known as cloud-based office productivity suites, has become an important element in the modern business and productivity environment. This represents a significant shift in the way companies manage office productivity applications and store data. In recent years, there has been a rapid shift from traditional ways of working to electronic offices (Diana, 2019). This shift is driven by the benefits of more flexible access and mobility for users. Employees can easily access documents and productivity tools from anywhere that facilitates remote work and team mobility. Furthermore, it supports collaboration, enabling real-time document sharing, co-commenting, and co-editing thereby increasing organizational productivity.

Bibliometric analysis is an analytical method that can be used to determine the progress of office cloud computing research. The result is bibliographic analysis, a type of meta-analysis of research data that can assist researchers in examining the bibliographic content and analyzing citations from journal articles and other scientific works.

Bibliometric analysis has been the subject of numerous studies, including those in medical field (Kokol, et al., 2021), economics (Firmansyah and Faisal, 2019; Rusydiana, 2019; Castillo-Vergara et al., 2018), strategic (Farrukh et al., 2021) and marketing management (Salimi et al., 2019), chemical engineering (Nandiyanto et al., 2021), Educational Research (Al-Husaeni et al., 2023), Bioenergy Management (Soegoto et al., 2022), Nanotechnology (Aleixandre-Tudó et al., 2020), Big Data (Xu and Yu, 2019; Parlina et al., 2020; Zhang et al., 2019; Liu et al., 2020), Scientific Publications (Mulyawati and Ramadhan, 2021), blockchain and internet of things (Kamran et al., 2020), societal technological megatrends (Jeflea et al., 2022), business model (Cuc, 2019), cybersecurity (Jalali, 2019), sustainable urban infrastructure (Du et al., 2019), financial innovation (Chen and Peng, 2020) and technology (Nasir et al., 2021), logistics (Bigliardi et al., 2021) and supply chain (Zhang et al., 2021), mental health (Akuntunde et al., 2021), farming system (Hirawan et al., 2022), sport entrepreneurship field (González-Serrano et al., 2019), and tourism (Niñerola et al., 2019).

But in spite of that, there has not been any study on shooting bibliometric analysis of data in office cloud computing that focuses to determine the development of research. Especially bibliometric analysis using the VOSviewer application for research conducted from 2013 to 2023.

Hence, this study aims to use VOSviewer software to conduct computational research on mapping bibliometric analysis of Google Scholar-indexed articles. The purpose of this study is to provide researchers, particularly those

working in the field of office and cloud computing, with a resource to determine the topic and conduct related research.

It is important at this moment to advance research on office cloud computing using computational bibliometric mapping. We can understand the evolution of office cloud computing research up to this point and learn the terms that are frequently used to refer to the subject by understanding the outcomes of computational bibliometric mapping analysis in the field of office cloud computing. Therefore, novelty in research is easier to be achieved.

METHOD

The article data used in this study is based on research that has been published in journals that are published in Google Scholar. We chose to use the Google Scholar database for this study because it is an open source. Research data is collected using Publish or Perish, a reference managing application. Publish or Perish software is used to conduct a literature review on the topics we selected. Research from Husaeni & Nandiyanto (2022) offers comprehensive instructions for installing and using the software, as well as a step-by-step process for acquiring data. A previous study by Azizah et al. (2021) offers comprehensive directions on how to use Google Scholar to look for information in libraries.

There are several stages of the research:

(i) Collecting publication data using Publish or Perish,
(ii) Processing bibliometric data for articles using Microsoft Excel,
(iii) Using VOSviewer application for computational mapping analysis of bibliometric published data, and
(iv) Examining the results of computational mapping

In Publish or Perish, publications are filtered based on the title's requirements using the keyword "office cloud computing" in the search for article data. The papers used were published between 2013 and 2023. The entire data was acquired in September 2023. The articles that had been collected and qualified for the research analysis were then exported into two different types of files: the research information system (.ris) and comma separated value format (*.csv). Trends can also be visualized and assessed using bibliometric maps and VOSviewer. The article data from the source database is then mapped.

The three forms of mapping publications that may be produced using VOSviewer are network visualisation, density visualisation, and network-based overlay visualisation (co-citation) between existing items. A bibliometric map must contain the keyword frequency at least five times. As a result, 275 less relevant keywords and terms are removed.

RESULTS AND DISCUSSION

Publication Data Search Results

By using the Publish or Perish, we search the Google Scholar database to find 997 article data that are qualified for the research. The article metadata that were collected are the author's name, title, year, journal name, publisher, number of citation, article links, and associated URLs. Table 1 lists several examples of published data that were used in this study's VOSviewer analysis. The data samples consisted of the top 20 papers with the highest number of citations. The total number of citations in the articles used in this study is 81,436 citations, 8143.60 citations per year, 81.68 citations per article, an average author of 2.84, an h-index of 135, and a g-index of 250 for all of them.

Table 1. Office Cloud Computing Publication Data

No	Authors	Title	Cites
1	Xu et al. (2018)	Industry 4.0: state of the art and future trends	2888
2	Gawer and Cusumano (2014)	Industry platforms and ecosystem innovation	2594
3	Abbas et al. (2017)	Mobile edge computing: A survey	2092
4	Oztemel and Gursev (2020)	Literature review of Industry 4.0 and related technologies	1652
5	Yue et al. (2016)	Healthcare data gateways: found healthcare intelligence on blockchain with novel privacy risk control	1260
6	Assunção et al. (2015)	Big Data computing and clouds: Trends and future directions	1134

7	Piotrowicz and Cuthbertson (2014)	Introduction to the special issue information technology in retail: Toward omnichannel retailing	1110
8	Silva et al. (2015)	Mobile-health: A review of current state in 2015	1051
9	Alshamaila et al. (2013)	Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework	1038
10	Farooq et al. (2015)	A review on internet of things (IoT)	1031
11	Gupta et al. (2013)	The usage and adoption of cloud computing by small and medium businesses	947
12	Jang-Jaccard and Nepal (2014)	A survey of emerging threats in cybersecurity	913
13	Whaiduzzaman et al. (2014)	A survey on vehicular cloud computing	877
14	Hu et al. (2017)	Survey on fog computing: architecture, key technologies, applications and open issues	856
15	Krombholz et al. (2015)	Advanced social engineering attacks	793
16	Yang et al. (2017)	Big Data and cloud computing: innovation opportunities and challenges	789
17	Pan and McElhannon (2017)	Future edge cloud and edge computing for internet of things applications	753
18	Lorido-Botran et al. (2014)	A review of auto-scaling techniques for elastic applications in cloud environments	747
19	Sommer (2015)	Industrial revolution-industry 4.0: Are German manufacturing SMEs the first victims of this revolution?	672
20	Aceto et al. (2020)	Industry 4.0 and health: Internet of things, big data, and cloud computing for healthcare 4.0	659

(Source: Processed data)

Research Development in The Field of Office Cloud Computing

Table 2 shows the development of office cloud computing research that has been published in Google Scholar-indexed journal. According to Table 2, 992 papers in the area of office cloud computing were published between 2013 and 2023. There were 127 articles in 2013, 134 articles in 2014, 103 articles in 2015, 113 articles in 2016, 94 articles in 2017, 95 articles in 2018, 96 articles in 2019, 94 articles in 2020, 78 articles in 2021, 40 articles in 2022, and 18 articles in 2023. Office cloud computing research is still infrequent on annual basis, especially in the recent 10 years (2013–2023), according to the number of publications. Figure 1 demonstrates how unstable its development is as well.

Figure 1 shows the development of office cloud computing research throughout the past ten years, from 2013 to 2023. Figure 1 shows that there was an increase in research on office cloud computing between 2013 and 2014. This increase is evidenced by the fact that 127 papers were published in 2013 and 134 in 2014. Research on office cloud computing varied between 2014 and 2019, however in the last two years, there have only been 40 articles in 2022 and 18 in 2023. The data indicates that because office cloud computing research is still new and unstable, the interest in it has dropped.

Table 2. The Development of Office Cloud Computing Research

Year of Publications	Number of Publications
2013	127
2014	134
2015	103
2016	113
2017	94
2018	95

2019	96
2020	94
2021	78
2022	40
2023	18
Total	**992**
Average	**90,2**

(Source: Processed data)

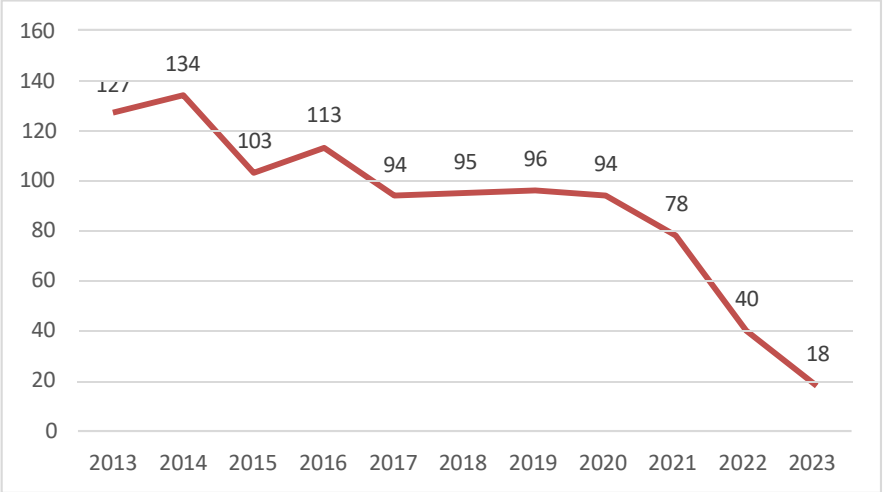

Figure 1. Development Level of Office Cloud Computing Research

Visualization of Office Cloud Computing Topic Areas Using VOSviewer

Computational mapping was conducted on the article's data. VOSviewer is used in computational mapping. The outcomes of computational mapping discovered 275 items. Each office cloud computing-related item is divided into eight clusters using data mapping:

(i) Cluster 1 has 57 items and is marked in red, the 57 items are adoption, analysis, barrier, case, client, cloud, cloud computing adoption, cloud computing application, cloud computing service, cloud service, comparative study, context, document, driver, e mail, email, emergence, enterprise, erp, example, facility, factor, google, google apps, google docs, ict, kind, management, medium sized enterprise, microsoft, microsoft office, model, ms office, new technology, office application, office software, office suite, office tool, order, organization, paas, perspective, saas, service, sme, smes, software, spreadsheet, strategy, student, study, teacher, tool, type, vendor, view, and web.

(ii) Cluster 2 has 46 items and is marked in green, the 46 items are accounting, basis, case study, cloud computing platform, cloud computing technology, collaboration, communication, company, computer technology, construction, cost, determinant, development, digital technology, digital transformation, effect, era, evidence, exploratory study, firm, front office, future, gmail, government, hardware, home office, impact, implementation, implication, information technology, integration, office, office space, performance, person, potential, practice, process, public sector, research, role, space, use, work, world, and year.

(iii) Cluster 3 has 41 items and is marked in blue, the 41 items are advantage, algorithm, approach, availability, cloud application, cloud computing, cloud data center, cloud environment, computing resource, customer, data center, demand, desktop, efficiency, environment, feature, flexibility, grid computing, layer, load, load balancing, lot, market, number, office automation, office environment, office hour, pay, platform, problem, resource, scalability, survey, task scheduling, technique, term, time, user, utility computing, utilization, and virtualization.

(iv) Cluster 4 has 34 items and is marked in yellow, the 34 items are blockchain, building, central office, cloud server, comparison, computing service, consumer, convergence, device, edge, edge computing, empirical study,

energy, experiment, fog, fog computing, form, framework, home, infrastructure, internet, iot, leverage, need, office building, paradigm, power, requirement, researcher, server, system, task, thing, and way.

(v) Cluster 5 has 33 items and is marked in purple, the 33 items are ability, architecture, art, author, big data, big data analytic, cloud technology, computing, data, database, definition, editorial office, health, healthcare, industry, information, innovation, issue, knowledge, new approach, opportunity, overview, paper, part, patient, private cloud, right, smart city, social medium, state, storage, systematic review, and utility.

(vi) Cluster 6 has 30 items and is marked in sky blue, the 30 items are area, article, artificial intelligence, benefit, business, cloud office, cloud storage, computer network, covid, day, e learning, education, field, higher education, information security, learning, literature review, machine learning, network, pandemic, privacy, research interest, rest, risk, security, set, tablet, technology, trend, and worker.

(vii) Cluster 7 has 26 items and is marked in orange, the 26 items are application, authentication, challenge, challenges, cloud computing environment, cloud service provider, component, concept, concern, data security, employee, future direction, mcc, mobile cloud, mobile cloud computing, mobile computing, mobile device, review, section, security challenge, security issue, service model, solution, taxonomy, threat, and usage.

(viii) Cluster 8 has 8 items and is marked in brown, the 8 items are access, cloud platform, computer, control, data storage, evolution, simulation, and social network.

The connection between two terms is shown in each of the existing clusters. Coloured circles serve as labels for each phrase. The size of the circle for each term depends on how frequently it occurs (Nandiyanto et al., 2021). According to Nandiyanto and Al Husaeni (2002), there is a positive correlation between the number of terms in the title and abstract and the size of the label circle. The label size is larger if the term is used more frequently (Al Husaeni and Nandiyanto, 2022). The mapping visualisation analyzed in this study is divided into three components: visualizations of the network (see Figure 2), density (see Figure 3), and overlay (see Figure 4) (Hamidah et al., 2020).

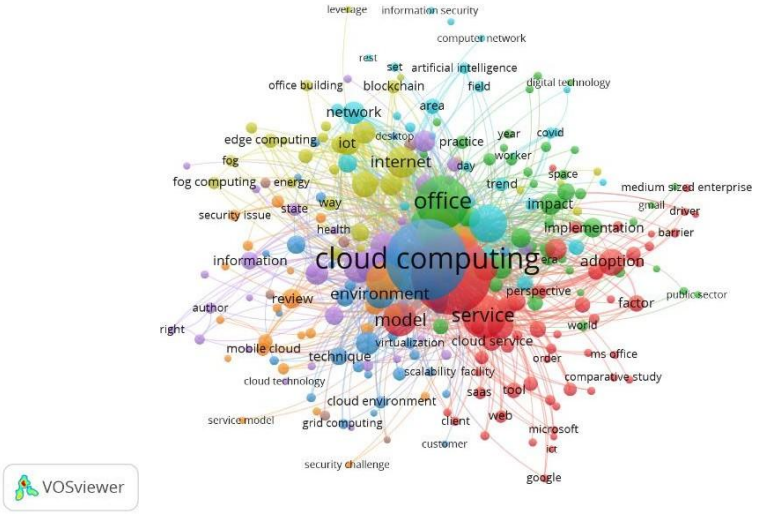

Figure 2. Network visualization of office cloud computing keyword.

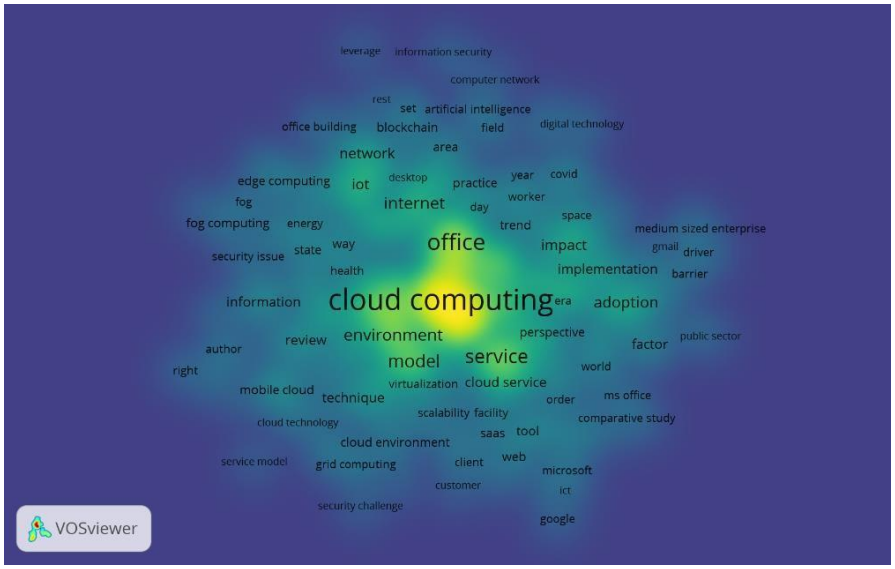

Figure 3. Density visualization of office cloud computing keyword.

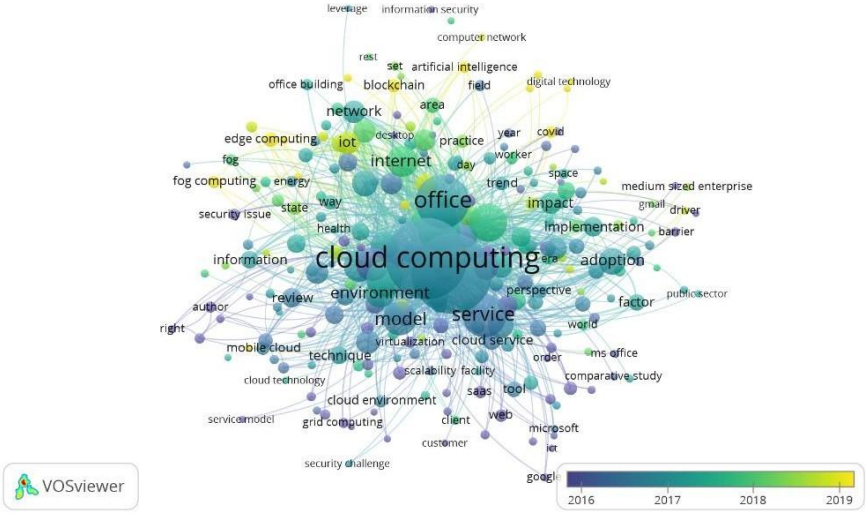

Figure 4. Overlay visualization of office cloud computing keyword.

Figure 2 shows the connection between terms. The connection between terms is depicted using interconnected network. Figure 2 shows the clusters of each term that are frequently studied and linked to the office cloud computing research topic. Based on the clusters in the network visualisation, three kinds of research on office cloud computing may be identified. Cloud computing term is in cluster 3 with 274 links, 3951 total link strength, with 632 occurrences (see Figure 5). The second term is cloud that is part of cluster 1 has 272 links, a total link strength of 3841, with 612 occurrences (see Figure 6). The third term is office that is part of cluster 2, has 253 links, a total link strength of 1731, with 275 occurrences (see Figure 7).

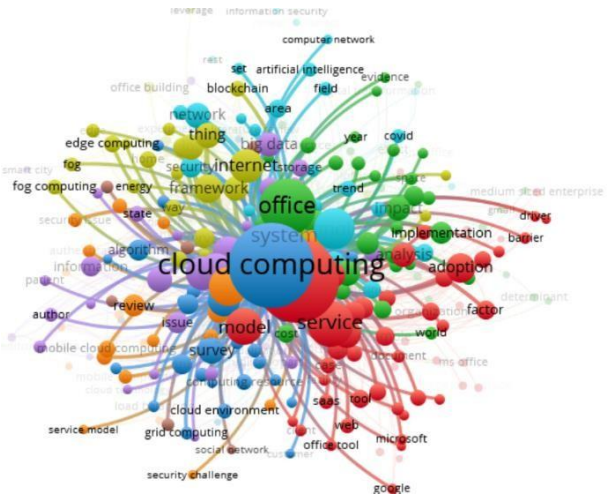

Figure 5. Network visualization of cloud computing term

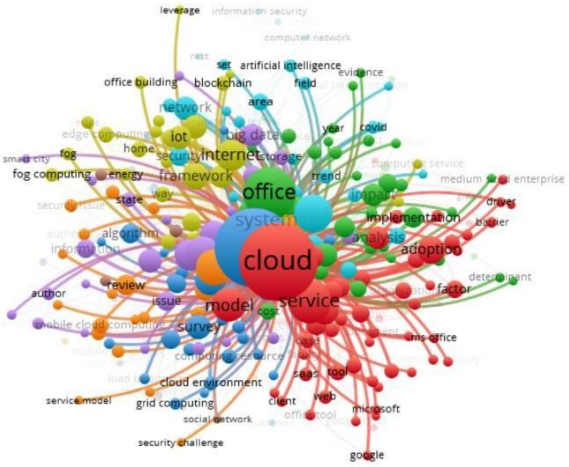

Figure 6. Network visualization of cloud term

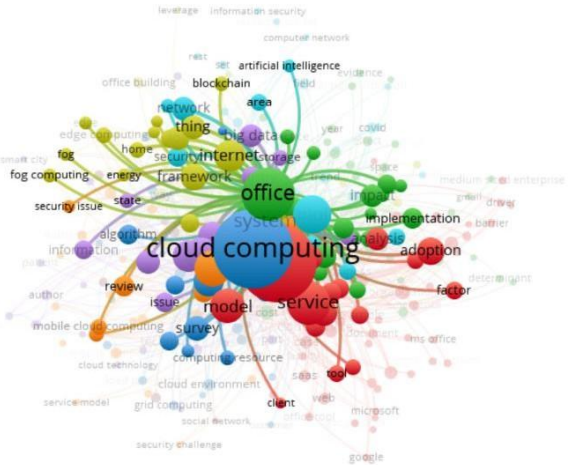

Figure 7. Network visualization of office term

Figure 3 shows the visualization of density. The circle is larger and the yellow color is brighter if the term "label" appears more frequently (Nandiyanto et al., 2021; Nandiyanto and Al Husaeni, 2021; Mulyawati and Ramadhan, 2021; Schrlau et al., 2016). This suggests that numerous studies related to the terms have been conducted. On the other side, if the term's colour fades to the background colour, there aren't many studies on it. Numerous studies have been conducted on the topics of cloud computing, offices, system, services, and models, as shown in Figure 3.

Figure 4 shows an overlay visualization of studies on office cloud computing. This visualization overlay illustrates the novelty of research on related terms (Nandiyanto et al., 2021; Nandiyanto and Al Husaeni, 2021; Al Husaeni and Nandiyanto, 2022; Hamidah et al., 2020). Figure 4 shows that the majority of research on office cloud computing was done between 2016 and 2017, which is further explained in Figure 8. In research, the termz "cloud computing," "cloud," and "office" have been used for a very long period. Consequently, it becomes easier to conduct innovative research on the term.

Figure 5 shows a network of cloud computing relationships with other terms, namely adoption, analysis, barrier, case, client, cloud, cloud computing adoption, cloud service, context, document, enterprise, example, facility, factor, google, management, microsoft, microsoft office, model, ms office, new technology, office application, office suite, office tool, organization, perspective, saas, service, sme, smes, software, strategy, student, study, tool, type, vendor, web, accounting, basis, case study, communication, company, cost, digital transformation, effect, era, evidence, front office, future, government, impact, implementation, integration, office, office space, performance, person, practice, process, research, role, space, use, work, world, year, advantage, algorithm, approach, availability, cloud application, cloud computing, cloud environment, computing resource, customer, data center, efficiency, environment, feature, flexibility, grid computing, layer, load, load balancing, number, office environment, platform, problem, resource, scalability, survey, task scheduling, term, time, user, utility computing, utilization, virtualization, blockchain, comparison, consumer, device, edge, edge computing, energy, experiment, fog, fog computing, framework, home, infrastructure, internet, iot, need, paradigm, requirement, server, system, task, thing, way, ability, architecture, art, author, big data, big data analytic, cloud technology, computing, data, database, definition, editorial office, health, industry, information, innovation, issue, opportunity, overview, paper, part, patient, social medium, state, storage, systematic review, utility, area, article, artificial intelligence, benefit, business, cloud storage, computer network, covid, day, e learning, education, field, learning, literature review, machine learning, network, privacy, risk, security, set, technology, trend, application, challenge, cloud service provider, concept, concern, employee, mobile cloud, mobile cloud computing, mobile computing, review, section, security challenge, security issue, service model, threat, usage, access, cloud platform, computer, control, data storage, evolution, simulation, and social network.

Figure 6 shows the network of relationships between the term cloud and existing terms, including adoption, analysis, barrier, case, client, cloud computing adoption, cloud service, comparative study, context, document, driver, email, emergence, enterprise, erp, example, facility, factor, google, google docs, management, medium sized enterprise, microsoft, microsoft office, model, ms office, office application, office software, office suite, office tool, order, organization, perspective, saas, service, smes, software, strategy, student, study, teacher, tool, vendor, view, web, accounting, basis, case study, communication, company, construction, cost, determinant, development, digital transformation, effect, era, evidence, exploratory study, firm, front office, future, government, hardware, home office, impact, implementation, implication, information technology, integration, office, performance, person, potential, practice, process, public sector, research, role, use, work, year, advantage, algorithm, approach, availability, cloud computing, cloud environment, computing resource, data center, efficiency, environment, feature, flexibility, grid computing, layer, load, load balancing, number, office hour, pay, platform, resource, scalability, survey, technique, term, time, user, utility computing, utilization, virtualization, blockchain, building, central office, comparison, computing service, consumer, device, edge, edge computing, energy, experiment, fog, fog computing, form, framework, home, infrastructure, internet, iot, leverage, need, office building, paradigm, server, system, task, thing, way, architecture, author, big data, big data analytic, computing, data, database, definition, editorial office, health, healthcare, industry, information, innovation, issue, new approach, opportunity, paper, part, private cloud, right, smart city, social medium, state, storage, systematic review, area, article, artificial intelligence, benefit, business, cloud office, cloud storage, covid, day, e learning, education, field, higher education, learning, literature review, machine learning, network, pandemic, privacy, risk, security, set, technology, trend, application, authentication, challenge, cloud computing environment, cloud service provider, component, concept, concern, data security, mcc, mobile cloud, mobile cloud computing, mobile computing, review, section, security challenge, security issue, service model, solution, threat, usage, access, cloud platform, computer, control, data storage, simulation, and social network.

While Figure 7 shows a office network that is associated with the term adoption, analysis, client, cloud, cloud service, enterprise, example, factor, management, microsoft office, model, service, software, strategy, study, tool, accounting, case study, cloud computing technology, communication, company, development, impact, implementation, integration, performance, person, practice, process, research, role, use, work, advantage, algorithm, approach, cloud computing, computing resource, environment, layer, platform, resource, survey, technique, time, user, blockchain, building, device, edge, edge computing, energy, experiment, fog, fog computing, framework, home, internet, iot, server, system, thing, architecture, big data, computing, data, database, industry, information, innovation, issue, opportunity, paper, state, storage, area, artificial intelligence, benefit, business, education, network, privacy, security, technology, application, challenge, concept, mobile cloud, mobile cloud computing, review, security issue, access, and computer.

These data show that cloud and cloud computing are more commonly related terms than office. According to the mapping results, the term "office" is connected to 93 terms through only 253 links. It is possible to conclude that research in the field of office cloud computing is still likely to be conducted and associated with other terms,

which will have a greater impact on the research's novelty than the fields of cloud and cloud computing, which typically have a higher level of relevance and are frequently associated with a variety of terms.

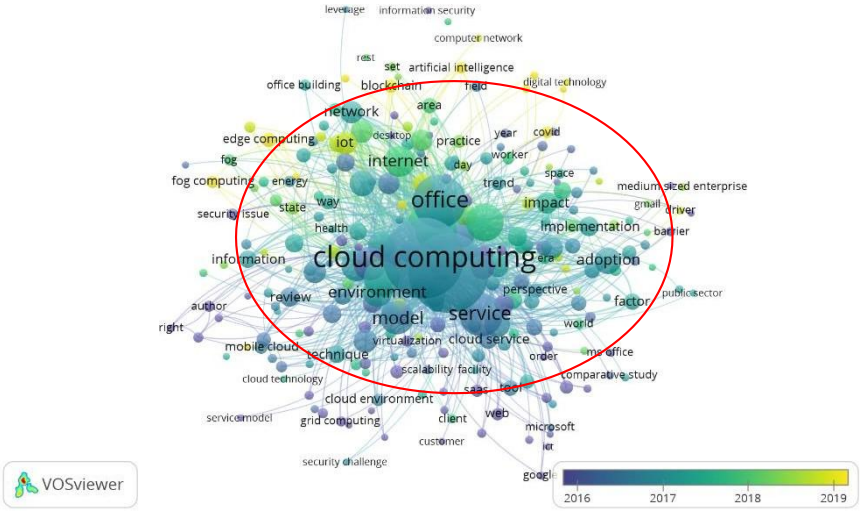

Figure 8. Overlay visualization of office cloud computing term in 2016 to 2019.

The mapping of the article data reveals that, in contrast to the terms cloud and cloud computing, the term "office cloud computing" is still rarely used in studies. We can look for the development of research on office cloud computing based on the findings of this study.

CONCLUSION

The focus of this study is computational mapping analysis of bibliometric information from research articles. The publication theme of this study is office cloud computing. The articles are collected from the Google Scholar database using Publish or Perish. The library data used in this study are titles and abstracts. According to the search results, 997 relevant articles were published between 2013 and 2023. The results show that there was an increase in research on office cloud computing between 2013 and 2014, followed by a fluctuation between 2014 and 2019, and a decline between 2019 and 2023. The results of the study show that there is a high probability that research on office cloud computing will be connected to other terms.

REFERENCES

Abbas, N., Zhang, Y., Taherkordi, A., & Skeie, T. (2017). Mobile edge computing: A survey. IEEE Internet of Things Journal, 5(1), 450-465.

Aceto, G., Persico, V., & Pescapé, A. (2020). Industry 4.0 and health: Internet of things, big data, and cloud computing for healthcare 4.0. Journal of Industrial Information Integration, 18, 100129.

Akintunde, T. Y., Musa, T. H., Musa, H. H., Musa, I. H., Chen, S., Ibrahim, E., ... & Helmy, M. S. E. D. M. (2021). Bibliometric analysis of global scientific literature on effects of COVID-19 pandemic on mental health. Asian journal of psychiatry, 63, 102753.

Al Husaeni, D. F., & Nandiyanto, A. B. D. (2022). Bibliometric using Vosviewer with Publish or Perish (using google scholar data): From step-by-step processing for users to the practical examples in the analysis of digital learning articles in pre and post Covid-19 pandemic. ASEAN Journal of Science and Engineering, 2(1), 19-46.

Al Husaeni, D. F., Nandiyanto, A. B. D., & Maryanti, R. (2023). Bibliometric analysis of educational research in 2017 to 2021 using VOSviewer: Google scholar indexed research. Indonesian Journal of Teaching in Science, 3(1), 1-8.

Aleixandre-Tudó, J. L., Bolaños-Pizarro, M., Aleixandre, J. L., & Aleixandre-Benavent, R. (2020). Worldwide scientific research on nanotechnology: a bibliometric analysis of tendencies, funding, and challenges. Journal of Agricultural and Food Chemistry, 68(34), 9158-9170.

Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. Journal of enterprise information management, 26(3), 250-275.

Assunção, M. D., Calheiros, R. N., Bianchi, S., Netto, M. A., & Buyya, R. (2015). Big Data computing and clouds: Trends and future directions. Journal of parallel and distributed computing, 79, 3-15.

Azizah, N. N., Maryanti, R., & Nandiyanto, A. B. D. (2021). How to search and manage references with a specific referencing style using google scholar: From step-by-step processing for users to the practical examples in the referencing education. Indonesian Journal of Multidiciplinary Research, 1(2), 267-294.

Bigliardi, B., Casella, G., & Bottani, E. (2021). Industry 4.0 in the logistics field: A bibliometric analysis. IET Collaborative Intelligent Manufacturing, 3(1), 4-12.

Castillo-Vergara, M., Alvarez-Marin, A., & Placencio-Hidalgo, D. (2018). A bibliometric analysis of creativity in the field of business economics. Journal of Business Research, 85, 1-9.

Chen, T. H., & Peng, J. L. (2020). Statistical and bibliometric analysis of financial innovation. Library Hi Tech, 38(2), 308-319.

Cuc, J. E. (2019). Trends of Business Model Research: A Bibliometric Analysis. Journal of Business Models, 7(5), 1-24.

Diana, B. A. (2019, May). Konsep E-Office Menuju Perubahan Pelayanan Birokrasi Berbasis Digital (good governance). In Prosiding Seminar STIAMI (Vol. 6, No. 1, pp. 9-15).

Du, H., Liu, D., Lu, Z., Crittenden, J., Mao, G., Wang, S., & Zou, H. (2019). Research development on sustainable urban infrastructure from 1991 to 2017: a bibliometric analysis to inform future innovations. Earth's Future, 7(7), 718-733.

Farooq, M. U., Waseem, M., Mazhar, S., Khairi, A., & Kamal, T. (2015). A review on internet of things (IoT). International journal of computer applications, 113(1), 1-7.

Farrukh, M., Shahzad, I. A., Meng, F., Wu, Y., & Raza, A. (2021). Three decades of research in the technology analysis & strategic management: a bibliometrics analysis. Technology Analysis & Strategic Management, 33(9), 989-1005.

Firmansyah, E. A., & Faisal, Y. A. (2019). Bibliometric analysis of Islamic economics and finance journals in Indonesia. Al-muzara'ah, 7(2), 17-26.

Gawer, A., & Cusumano, M. A. (2014). Industry platforms and ecosystem innovation. Journal of product innovation management, 31(3), 417-433.

González-Serrano, M. H., Jones, P., & Llanos-Contrera, O. (2019). An overview of sport entrepreneurship field: a bibliometric analysis of the articles published in the Web of Science. Sport in Society.

Gupta, P., Seetharaman, A., & Raj, J. R. (2013). The usage and adoption of cloud computing by small and medium businesses. International journal of information management, 33(5), 861-874.

Hamidah, I., Sriyono, S., & Hudha, M. N. (2020). A Bibliometric analysis of Covid-19 research using VOSviewer. Indonesian Journal of Science and Technology, 34-41.

Hirawan, D., Oktafiani, D., Fauzan, T. A., Luckyardi, S., & Jamil, N. (2022). Research trends in farming system soil chemical: A bibliometric analysis using VOSviewer. Moroccan Journal of Chemistry, 10(3), 10-3.

Hu, P., Dhelim, S., Ning, H., & Qiu, T. (2017). Survey on fog computing: architecture, key technologies, applications and open issues. Journal of network and computer applications, 98, 27-42.

Jalali, M. S., Razak, S., Gordon, W., Perakslis, E., & Madnick, S. (2019). Health care and cybersecurity: bibliometric analysis of the literature. Journal of medical Internet research, 21(2), e12644.

Jang-Jaccard, J., & Nepal, S. (2014). A survey of emerging threats in cybersecurity. Journal of computer and system sciences, 80(5), 973-993.

Jeflea, F. V., Danciulescu, D., Sitnikov, C. S., Filipeanu, D., Park, J. O., & Tugui, A. (2022). Societal technological megatrends: a bibliometric analysis from 1982 to 2021. Sustainability, 14(3), 1543.

Kamran, M., Khan, H. U., Nisar, W., Farooq, M., & Rehman, S. U. (2020). Blockchain and Internet of Things: A bibliometric study. Computers & Electrical Engineering, 81, 106525.

Kokol, P., Blažun Vošner, H., & Završnik, J. (2021). Application of bibliometrics in medicine: a historical bibliometrics analysis. Health Information & Libraries Journal, 38(2), 125-138.

Krombholz, K., Hobel, H., Huber, M., & Weippl, E. (2015). Advanced social engineering attacks. Journal of Information Security and applications, 22, 113-122.

Liu, X., Sun, R., Wang, S., & Wu, Y. J. (2020). The research landscape of big data: a bibliometric analysis. Library Hi Tech, 38(2), 367-384.

Lorido-Botran, T., Miguel-Alonso, J., & Lozano, J. A. (2014). A review of auto-scaling techniques for elastic applications in cloud environments. Journal of grid computing, 12, 559-592.

Mulyawati, I. B., & Ramadhan, D. F. (2021). Bibliometric and visualized analysis of scientific publications on geotechnics fields. ASEAN Journal of Science and Engineering Education, 1(1), 37-46.

Nandiyanto, A. B. D., & Al Husaeni, D. F. (2021). A bibliometric analysis of materials research in Indonesian journal using VOSviewer. Journal of Engineering Research.

Nandiyanto, A. B. D., Al Husaeni, D. N., & Al Husaeni, D. F. (2021). A bibliometric analysis of chemical engineering research using vosviewer and its correlation with covid-19 pandemic condition. Journal of Engineering Science and Technology, 16(6), 4414-4422.

Nasir, A., Shaukat, K., Iqbal Khan, K., A. Hameed, I., Alam, T. M., & Luo, S. (2021). Trends and directions of financial technology (Fintech) in society and environment: A bibliometric study. Applied Sciences, 11(21), 10353.

Niñerola, A., Sánchez-Rebull, M. V., & Hernández-Lara, A. B. (2019). Tourism research on sustainability: A bibliometric analysis. Sustainability, 11(5), 1377.

Oztemel, E., & Gursev, S. (2020). Literature review of Industry 4.0 and related technologies. Journal of intelligent manufacturing, 31, 127-182.

Pan, J., & McElhannon, J. (2017). Future edge cloud and edge computing for internet of things applications. IEEE Internet of Things Journal, 5(1), 439-449.

Parlina, A., Ramli, K., & Murfi, H. (2020). Theme mapping and bibliometrics analysis of one decade of big data research in the scopus database. Information, 11(2), 69.

Piotrowicz, W., & Cuthbertson, R. (2014). Introduction to the special issue information technology in retail: Toward omnichannel retailing. International Journal of Electronic Commerce, 18(4), 5-16.

Rusydiana, A. S. (2019). Bibliometric analysis of Scopus-indexed waqf studies. Ekonomi Islam Indonesia, 1(1), 1-17.

Salimi, D., Tavasoli, K., Gilani, E., Jouyandeh, M., & Sadjadi, S. (2019). The impact of social media on marketing using bibliometrics analysis. International Journal of Data and Network Science, 3(3), 165-184.

Schrlau, M. G., Stevens, R. J., & Schley, S. (2016). Flipping Core Courses in the Undergraduate Mechanical Engineering Curriculum: Heat Transfer. Advances in Engineering Education, 5(3), n3.

Silva, B. M., Rodrigues, J. J., de la Torre Díez, I., López-Coronado, M., & Saleem, K. (2015). Mobile-health: A review of current state in 2015. Journal of biomedical informatics, 56, 265-272.

Soegoto, H., Soegoto, E. S., Luckyardi, S., & Rafdhi, A. A. (2022). A bibliometric analysis of management bioenergy research using VOSviewer application. Indonesian Journal of Science and Technology, 7(1), 89-104.

Sommer, L. (2015). Industrial revolution-industry 4.0: Are German manufacturing SMEs the first victims of this revolution?. Journal of Industrial Engineering and Management, 8(5), 1512-1532.

Whaiduzzaman, M., Sookhak, M., Gani, A., & Buyya, R. (2014). A survey on vehicular cloud computing. Journal of Network and Computer applications, 40, 325-344.

Xu, L. D., Xu, E. L., & Li, L. (2018). Industry 4.0: state of the art and future trends. International journal of production research, 56(8), 2941-2962.

Xu, Z., & Yu, D. (2019). A Bibliometrics analysis on big data research (2009–2018). Journal of Data, Information and Management, 1(1), 3-15.

Yang, C., Huang, Q., Li, Z., Liu, K., & Hu, F. (2017). Big Data and cloud computing: innovation opportunities and challenges. International Journal of Digital Earth, 10(1), 13-53.

Yue, X., Wang, H., Jin, D., Li, M., & Jiang, W. (2016). Healthcare data gateways: found healthcare intelligence on blockchain with novel privacy risk control. Journal of medical systems, 40, 1-8.

Zhang, X., Yu, Y., & Zhang, N. (2021). Sustainable supply chain management under big data: A bibliometric analysis. Journal of Enterprise Information Management, 34(1), 427-445.

Zhang, Y., Huang, Y., Porter, A. L., Zhang, G., & Lu, J. (2019). Discovering and forecasting interactions in big data research: A learning-enhanced bibliometric study. Technological Forecasting and Social Change, 146, 795-807.

Zulkifli, S. E., Al Asy Ari Adnan Hakim, S. E., Ramadhaniyati, R., Wau, L., Ali, I. H., Dhiana Ekowati, S. E., ... & Hi, M. (2023). EKONOMI DIGITAL. Cendikia Mulia Mandiri.