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A Bibliometric Analysis of E-Government Research

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Abstract: E-government research has increasingly been raised since ICT was used in the public sector, but it has not yet reached the maturity stage. It contributes to the high number of research published in recent years. However, there is still limited or no bibliometric analysis conducted to analyze e-government research as a whole in the last decade. The purpose of the study is to establish bibliometric analysis as an extensive review of e-government literature. The method used in this study consists of five steps: defining search keywords, initializing search results, refining search results, compiling preliminary data statistics and analyzing data. The result shows that as many as 4322 datasets were refined from Scopus databases and visualized using Vosviewer. The cluster analysis shows the main research topics in the e-government field based on its unique association of the set of keywords within the cluster. The study also presents the potential topics for future study based on the analysis of keywords with less frequent occurence.

Keywords: E-government, Bibliometric, Analysis, Review, Vosviewer

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I. INTRODUCTION

E-government is a multidisciplinary field of research that examined from a variety of different approaches. E-government is still a relatively new phenomenon and is currently still evolving (Dwivedi, 2009). According to (Alcaide, Pedro, Bolívar, Jesús, & Herrera, 2017), e-government research has a continuous growth but it has not arrived at the maturity stage. Nevertheless, the characteristic of e-government as a robust multidisciplinary approach contributed to the high quantity of research available in recent years. E-government literatures has rapidly increased in the number of studies discovered in various publications outlets following ICT's implementation in the public sector, which raised and paid attention to the concern of scholars and researchers worldwide. Many researchers have analyzed and reviewed electronic government literatures with different objectives such as a whole (Heeks & Bailur, 2007; Yildiz, 2007) or a particular area for example public health (Tursunbayeva, Franco, & Pagliari, 2017), e-participation (Sæbø, Rose, & Skiftenes Flak, 2008); or specifically in particular countries such as United States (Snead & Wright, 2013), Portuguese (Diaz, 2016) or focusing on the methodology, lessons learned, or problems related to this area (Pedro & Bolívar, 2010). Those appraisals can provide an outstanding overview of the recent state of the art (SOTA) and allow a thoughtful examination of the contributions in the particular research field (Pedro & Bolívar, 2010). Considering that the research of e-government is still emerging, a longitudinal review based on e-government literature is needed to notice research developments and predict potential advancement in future research. The data can be used as a guidance by researchers, policy makers especially government

institutions for further analyses (Bayu, Nandiyanto, Biddinika, & Triawan, 2020).

The term bibliometrics was discovered in 1969 by Pritchard and defined as "the application of mathematics and statistical methods to books and other media of communication" (Pritchard, 1969). The bibliometric methods incorporate text analysis, citation analysis, content analysis, keyword co-occurrence, co-citation analysis, or co-authoring analysis (Dias, 2019). The bibliometric analysis is quite close to the broad term that is info metric, or in a more narrow term, scientometric. Another familiar analogy is webometric, which inspects different parts of a web (Ellegaard & Wallin, 2015).

Bibliometric analysis basically identifies a set of literatures, usually associated as a publication dataset on particular subject areas. Statistical tools are handy to be utilized as a part of the analysis of the dataset. Initially, bibliometric analysis mainly examined the scientific aspects of production in the form of the number of publications produced and publications with high citations, usually called citation analysis. Citation analysis is a traditional bibliometrics method that is most often used to measure scientific quality indicators for individual researchers, a ranking of institutions or universities, or even a country or, in other words, assesses the impact of publications (Ellegaard & Wallin, 2015). However, in its development, the use of bibliometric is increasingly used to deliver information surrounding interrelationships among diverse authors, groups, research topics, institutions, et cetera. This information is typically scattered within the research pieces of literature or written publications. For researchers, this is valuable knowledge to be alerted of the new research trends and to collaborate with others. Practical implications for many institutions, including government agencies, increasingly demand productivity or performance reports from their staff. Thus,

bibliometric studies could also benefit all cases.

Put it differently, when bibliometric is used in academic research, it could be defined as "a set of methods to provide a quantitative analysis of written publications". The most common metrics used in bibliometric analysis comprises the publications number, the citations amount, citation average per article, the h-index, and co-authorship (Dias, 2019). Notwithstanding its benefits, the analysis of bibliometric data must be performed with care. Most criticism of bibliometrics is based on the fact that the impact, as counted by citation indicators, does not certainly indicate quality. Besides, different field are likely to have very different publications and citation patterns. Thus a direct evaluation of publications and citation metrics for different subjects should be carefully applied.

2. RELATED WORKS

The type of research conducted to analyze e-government literature appears in various terms such as systematic review, bibliometric analysis, scientometric, or even traditional literature review. The bibliometric analysis is still limited especially in e-government research. This section allows us to evaluate some previous researches that apply bibliometric analysis in e-government literature.

Arias, Serra, Guerrazzi, & Ferreira (2019) conducted a bibliometric study on e-government research toward public administration research. The study collected data from high-quality journals in the Database of ISI Web of Science, especially 37 top public administration journals with IF (Impact Factor) of at least 0.8, which were listed in the Journal Citation Report (JCR) of the Social Science Citation Index (SSCI). They found current knowledge in e-government literatures and present current mainstream research. Eventually, the limitation of this research is in terms of journal selections. They include only the literature from public

administration journals. However, many e-government researches are conducted from different fields such as computer science, social sciences, communications, economy, et cetera; this is as stated (Altameem, Zairi, & Alshawi, 2006; Assar, Boughzala, & Boydens, 2011) in which e-government has a wide dimension and is developed from various multidisciplinary research.

In another research, Dias (2019) conducted a bibliometric study to review specific years of e-government studies, especially for Ibero-American (IA) countries. The scopus database was used as information sources and resulting 1129 dataset from 2003-2017. This research found e-government research produced by IA countries, including the most productive and impacting authors, the most related subject areas, and definite research themes or issues that have more considerable attention within IA communities. These include transparency, citizen participation, and social media. However, this infers that researchers might not be included in this study if they belong to other institutions outside the IA community. Similarly, if a study concerning their community did not contain any researchers from IA community, then the study is not included.

Other researchers (Khan, Moon, Park, Swar, & Rho, 2011) also conducted a review of e-government research literature based on bibliometric analysis for 11 years of publication (2000-2010). They emphasized the research based on the socio-technical perspective on developing countries. They discover that e-government research in developing countries had increased rapidly in recent years, including many issues or topics from social-technical aspects. However, the findings are based on works of literature solely from the core of electronic government research journals such as quarterly government information, electronic journals of e-government, et cetera. Thus, it is cautioned to make generalizations of the results. Similar research was also conducted by Heeks & Bailur (2007) which have analyzed the publications of e-government research through only three selected journals/conferences: Information polity (2002-2004), quarterly government information (2001-2005) and European conference on e-government (2001-2005).

Thus as the nature of the bibliometric analysis, our research depletes, reviews all literatures and takings into account a varied research outlets (journals). We also considered that e-government is a multidisciplinary field, thus it covers a various of publications outlets. In addition, kinds of e-government literatures have been published since the previous bibliometric analysis conducted in 2007 (Heeks & Bailur, 2007; Yildiz, 2007). Therefore, our research is also intended to update the previous bibliometric analysis. To the best of our knowledge, there is no bibliometric analysis conducted to analyze e-government literature in the last decade. The article collecting period also spans 2011-2020 because the seminal study of Khan, Moon, Park, Swar, & Rho (2011) encompasses up to 2010. The purpose of the research is review e-government literatures by providing an extensive bibliometric analysis to answer the following research questions (RQ):

RQ1 : How is the trend of e-government research based on the number of publication per year?

RQ2 : What journals that have most papers published in area of e-government research?

RQ3 : Who are the most contributing authors in publication of e-government research?

RQ4 : What are the subject areas or disciplines that contribute to e-government research?

RQ5 : What are main research topics and in e-government field?

RQ6 : What are potential topics for future study in area of e-government research?

RQ7 : Which are the countries of author that contribute the most to the publication in e-government research and their collaboration?

RQ8 : Which articles have the most influence based on citation measures in e-government literatures?

3. Research Methods

The bibliometric analysis in this research follows the suggestion (Garza-Reyes, 2015). The process is performed systematically and uses explicit stages; therefore, it can be reproduced by other researchers. A bibliometric analysis can also be accomplished with a mind-mapping approach that shows the limits of knowledge (Tranfield, Denyer, & Smart, 2003). Bibliometric analysis is commonly used in various disciplines and focus on quantitative studies in journal articles, books, or other forms of written publications (Heersmink, van den Hoven, van Eck, & van Berg, 2011). In this research, five stages of the bibliometric analysis will be adopted, consisting of defining the search keywords, initial search results, refinement of search results, compiling preliminary data statistics, and data analysis, as shown in Figure 1. The five stages are performed to obtain comprehensive data and evaluations toward researches in the e-Government field.

Figure 1. Five Phase of Bibliometric Analysis (Garza-Reyes, 2015)

3.1. Defining the search keywords

This research was performed on June 21, 2020, using keywords in the form of search strings relevant to e-Government where keywords are searched based on the title, keywords, and abstract of the article as follows:

TITLE-ABS-KEY ("e-government") OR TITLE-ABS-KEY ("e-gov") OR TITLE-ABS-KEY ("electronic government") OR TITLE-ABS-KEY ("digital government") OR TITLE-ABS-KEY (egovernment)

Based on the defined keywords, the process of searching for articles in an electronic database is utilized as a source of information. The electronic database used in this research is Scopus, considering that Scopus is the largest reputable scientific database currently available and provides various peer-reviewed journal articles; thus, the quality of the articles obtained can be guaranteed.

3.2 Initial search result

The initial search results with keywords yielded 14,892 Scopus documents. In finding articles, the period is unlimited since this research aspires to map the research development (state of the art) of the e-government theme as a whole. According to our results, the article related to e-government was first found in early 1980, as shown in Table 1. Unfortunately, the research in 1979 is not relevant to our research interest.

Tabel 1. Term of e-government appeared first in journal/proceedings articles

Author	Title	Source	Year of Publication
Ezaki, M.(Ezaki, 1979)	"Linking national econometric models of Japan, USA, and the East and Southeast Asian countries - a pilot study"	Southeast Asian Studies (Kyoto), 17(2), pp. 178-200	1979
Zaretsky, H.W (Zaretsky, 1981)	"A proposal: statewide Hospital economic control program"	Hospital and Health Services Administration, 26(2), pp. 70-94	1981
Sagafi-Nejad, T. (Sagafi-Nejad, 1984)	"Egypt"	World Development	1984

3.3. Refinement of Search Result

After obtaining the initial results, then we conducted a screening of all articles based on the inclusion criteria determined in this research. There are two (2) inclusion criteria used to screen the search results: (i) IC1: Original research written in English; (ii) IC2: Articles published only in peer-reviewed journals as the source type. Thus, proceedings (conference papers), book chapters, books, newspapers, letters, editorials are not included in the dataset; this is achieved to obtain an excellent scientific contribution solely sourced from peer-reviewed journals. The elimination of the article is also performed if duplicate articles are found. Then after refinement, the results were saved in the form for the RIS extension file. The resulting RIS file was used for further data analysis. Table 2 summarize the amount of all articles obtained after refinement process.

Table 2. Refinement of Search Result

Search Keyword	Number of Scopus documents
(TITLE-ABS-KEY ("e-government") OR TITLE-ABS-KEY ("e-gov") OR TITLE-ABS-KEY ("electronic government") OR TITLE-ABS-KEY ("digital government") OR TITLE-ABS-KEY (egovernment)) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j"))	4322

3.4. Compile Preliminary Data Statistics

As mentioned earlier, the data collected following the refinement search results are stored in the form of RIS files. Then the file is processed with the help of reference manager software (RMS) Mendeley to complete the metadata of the articles obtained such as the author's name, title, keywords, abstract and journal description (journal name, year of publication, volume, issue, pages). The dataset was verified, and the required information was added when there was incomplete data. Then the search result data was analyzed and classified based on the yearly number of publications, publication outlets (journals), contributing authors, and subject area.

Trend of e-government research based on number of publication per year (RQ1)

Figure 2 show the trend of research on e-government based on the number of articles published per year. In general, E-government research in the world started to grow for the first time since 2000 (a total of 9 publications), and presently the research trend is still advancing in term of the number of publications. This finding is in line with research, which states that e-government research penetration has increased since 2000 (Alcaide et al., 2017); In understanding the research trend, an analysis of published data is only conducted until 2019 due to 2020 is still ongoing.
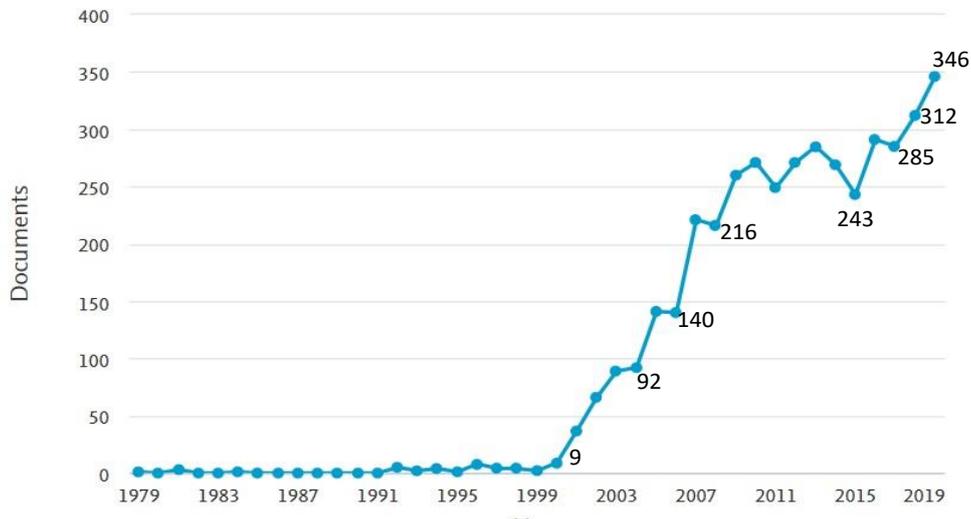

Figure 2. Trend research of e-Government in the worldwide

Journals that have most papers published in area of e-government research (RQ2)

Figure 3 shows the top ten peer-reviewed journals with most publications in the research of e-government and contributing roughly 1352 articles (31%) out of total data (4322 articles) over approximately 40 years (1979-2020). The journal's leader based on publication numbers is Government Information Quarterly, which has a total of 395 articles. This journal was published by Elsevier, one of the biggest publishers in scientific publications, then followed by Electronic Government published by Inderscience that contributes to publishing a total of 283 articles and Transforming Government People Process and Policy (165 articles) published by Emerald as also a major scientific publisher in the world.

The most productive authors in publication of e-government research (RQ3)

Figure 4 indicates the top ten contributing authors with published articles in peer-reviewed journals. Weerakkody has become the most productive author in the list who has authored around 46 articles. Dwiyed has authored 40 articles, followed by Jannsen, Jaeger, Irani, and Reddick, who authored 30 articles. Other than Gill-Garcia, Bertot, Williams, and Rana are also who have contributed high number articles in e-government field.
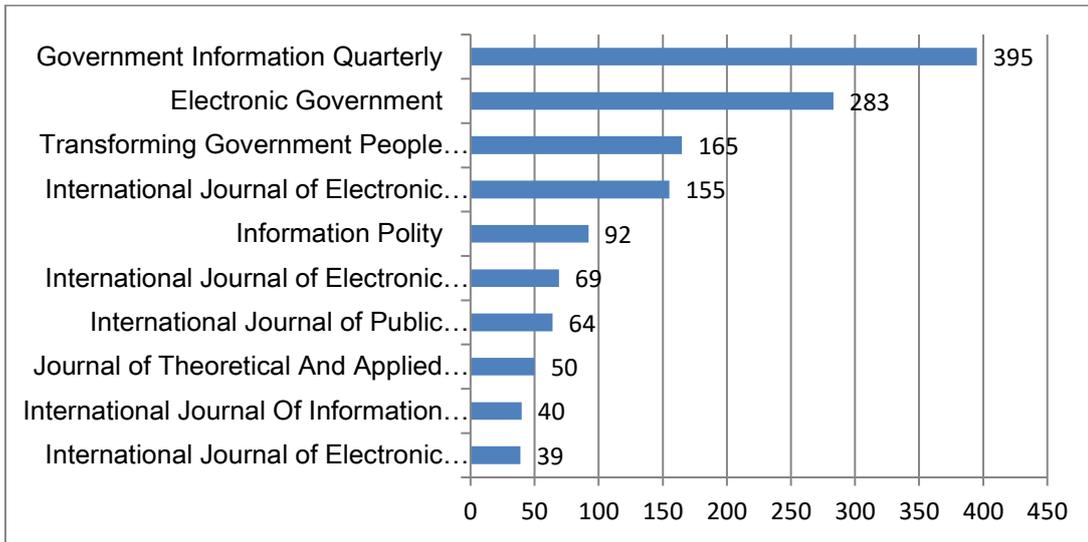
Figure 3. Top Ten Journals have most papers published in area of e-Government research
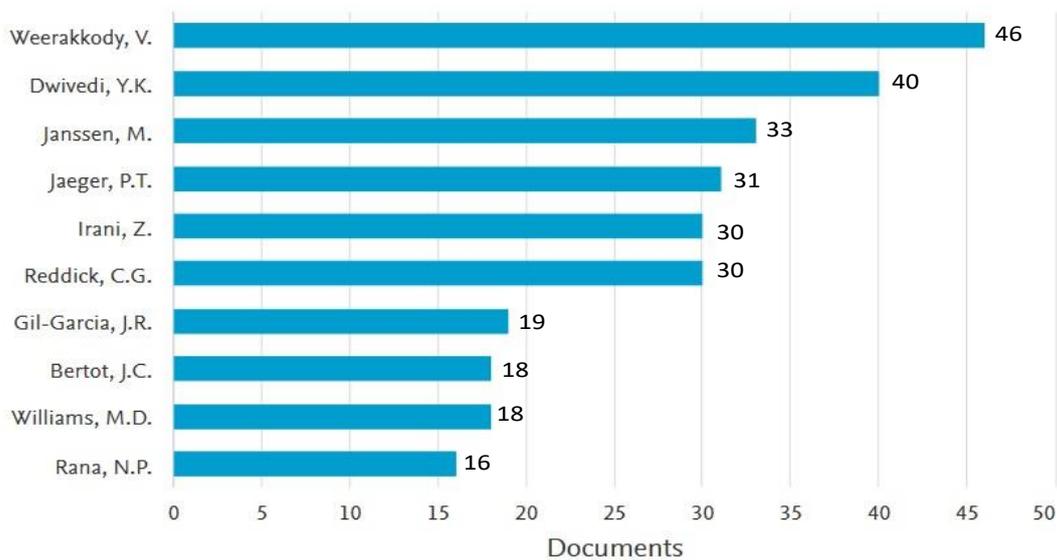
Figure 4. Top Ten Contributing Authors in area of e-government research in the worldwide

The subject areas or disciplines that contribute to e-government research (RQ4)

Figure 5 shows that publications in e-government field originate from several subjects or disciplines where social sciences have dominated the publications with 2665 articles (34.2%), followed by computer science with 2292 articles (29.1%), business, management & accounting with 849 articles (10.8%). The rest of the subject areas contribute to the area of e-government research.

Figure 5. Several subject area of e-government research based on publications

3.5. Data Analysis

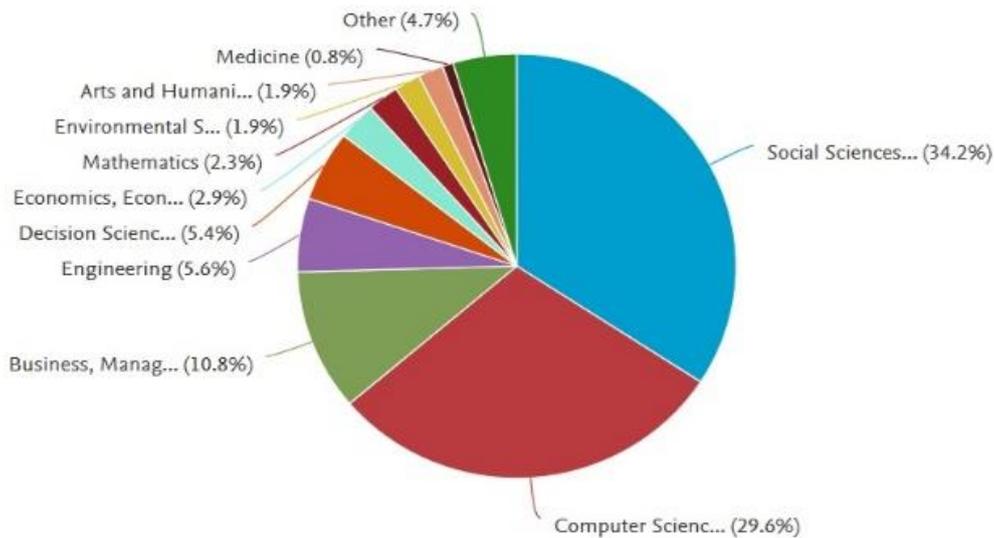The bibliometric data which has been saved in RIS format will be visualized using Vosviewer software. According to (Hudha et al., 2020), Vosviewer can be applied to analyze and make graphical representations in the form of bibliometric maps. Vosviewer is widely used due to its capability to work with large datasets, display the sizeable bibliometric map with easy understanding and interpreting way. Based on Van Eck & Waltman (2010) study, Vosviewer could handle large maps and display a co-citation map of huge major scientific journals. Vosviewer can also make publication maps, country maps, author maps, or journal maps based on networks of co-citation or building keyword maps as topics modeling. Furthermore, as a free tool, Vosviewer nowadays has been utilized to accomplish research related to data mining, articles grouping and articles mapping from database sources (Xie, Chen, Wang, Zheng, & Jiang, 2020).

4. RESULT & DISCUSSION
4.1. Topic Area Visualization Using Vosviewer

In this section, the bibliometric analysis was conducted to visualize the result based on keywords that occured frequently. This is very useful because it could show us the topic that had been researched for a period of 40 years (1979-2020). Vosviewer also provide cluster anlaysis that indicate the relationship between one topic and another (Hamidah, Sriyono, & Hudha, 2020; Hudha et al., 2020) especially in area of e-government research. Thus, this reseach has mapped bibliometric analysis in three different visualizations, they are (1) data network visualization as seen in Figure 6; (2) overlay visualization in Figure 7; and (3) density visualization in Figure 8.

Figure 6. Network Visualizations of Scopus Database using Vosviewer

In Figure 6, the visualization of items (keywords) related to e-government research topics was labeled and symbolized as circles by default in Vosviewer. An item or keyword is increasingly important as the more often it appears, the bigger the circle will be. The frequency of occurrence determines the size of the items. Naturally, the keyword of e-government was the top of research topic since it has the highest frequency of occurrence. When the color is assigned to the items, each circle has a different color belonging to its cluster (van Eck & Waltman, 2010).

Figure 7. overlay Visualizations of Scopus Database using Vosviewer

The result was extracted from the frequency of occurrence of author keywords based on bibliographic data using Vosviewer. A keyword minimum occurrence number of

10 was set. Then we obtained 8879 keywords and only 250 keywords that met the threshold. Several common words not indicating a topic were excluded such as case studies, metadata, empirical studies, sem, methodology, surveys, survey research, research, and simulation. After analyzing the result, we obtained a total of 11 clusters as research topics trends in e-government field indicated by different colors.

The main topics and research stream in area of e-government research (RQ5)

Figure 6 network visualization describes 11 clusters and their interrelationship within studied topic areas. Each cluster consists of some keywords that possess a strong agreement between them in the map's structure. For each cluster, there are some high-frequency occurrences of keywords representing the research focus conducted in previous researches. For example, the first cluster has the most occurence terms: trust (108), adoption (95), and developing countries (74). The fifth cluster with social media (103), transparency (87), and open government (6) as the highest common term. The seventh cluster consists of the most common terms, such as the digital divide (86), e-participation (73), and e-democracy (69). For simplicity in this research, we limit only the top three keywords with the most frequency of occurrence, as reported in Table 2.

Each cluster describes a particular (main) topic as a research direction in e-government field based on its unique association of the set of keywords within the cluster while the keywords on each cluster represents the research stream. From the first cluster, we can see the main research topics in e-government is related to its adoption and the issue of trust in developing countries. These kind of data could allow addressing RQ5, which is the main research topic and research stream in the e-government field. In this research, we do not assign a name or label to each cluster since it needs careful inspection, and there are some overlapped keywords among clusters.

The potential topics in area of e-government research for future study (RQ6)

Table 2 also shows some keywords that have less frequent of occurence become potential topics to be examined for future research such as 'attitude (10)', 'website evaluation (11)', 'digital economy (10)', 'digital inclusion (10)', 'public procurement (10)', 'transformational government (11)', 'information architecture (10)', 'simulation (10)', 'open innovation (10)', 'data mining (11)', 'ontologies (12)', 'e-learning (12)', 'acceptance (10)', 'digital democracy (11)', 'e-government policy (10)', 'e-health (11)', 'it governance (10)', 'measurement (11)', 'blockchain (10)', 'performance evaluation (10)', 'crm (10)', and 'municipality (12)'. For simplicity, we limit only two less used keyword for each clusters.

Figure 7 shows a research topic in terms of year, yet most occurrence keywords appear from 2010 until 2016. Figure 8 shows density visualization using Vosviewer, which indicates the depth of research studied in certain areas of e-government. The density of items determines the appearance of keywords in the number represented by the color. The more concentrated of the colors indicate the research has grown in high numbers. Thus, we could notice the keyword with less frequent occurrence represented by unconcentrated color, means the research topic is still limited that need more investigation for future study (potential topic). Some sample of these keywords such as blockchain with 11 occurrences, electronic voting (11), digital democracy (11), open government data (12), government 2.0 (13), smart government (15), et cetera. Thus, this results provide opportunities for researchers to identify the potential topic as a novel contribution to work in the area of e-government research. Furthermore, based on the interrelationship of keywords, we can find that a particular keywords do not relate to other keywords. For instance,

"government 2.0" and "big data" keywords. It means both keywords has never been studied together, providing the chance of new trend of research arise.

Figure 8. Density Visualizations of Scopus Database using Vosviewer

Those potential topics in area of e-government reseach need more investigation in the future. Thus, Figure 6, 7 and 8 provide the opportunities for researchers to identify the potential topic as novel contribution of work in area of e-government research. In term of interrelationship of research topic, we could know that for instance a keyword "government 2.0" has never been studied with "big data" in the same time since they are in different cluster. This kind of topic is quitely new trend for researcher to conduct based on the combination of term.

Table 2. The Result of Cluster Analysis

No	Cluster	Most frequent Keywords	Keywords
1.	First Cluster – 42 items	**Trust (108), adoption (95), developing countries (74)**	Attitude (10), awareness (11), citizen (28), citizen satisfaction (16), citizens (47), culture (14), e-filing (13), e-government adoption (27), e-government services (59), e-goverment systems (10), factors (11), india (45), indonesia (19), information quality (18), intention to use (13), is success model (10), jordan (40), m-government (27), malaysia (29), mobile government (21), nigeria (13), pakistan (11), perceived ease of use (14), perceived risk 12), perceived usefulness (16), satisfaction (25), service quality (37), social influence (12), south africa (11), tam (35), technology acceptance (13),

			technology acceptance model (43), technology acceptance model (tam) (12), technology adoption (34), user satisfaction (15), utaut (31) and website evaluation (11)
2.	Second Cluster – 36 items	**Egovernment (122), digital government (99), china (36)**	Actor-network theory (10), brazil (13), citizen engagement (17), decision making (23), developing countries (11), digital economy (10), digital governance (11), digital inclusion (10), digital transformation (15), digitalization (16), e-government development (14), e-government evaluation (10), eparticipation (10), europe (16), ghana (11), gis (15), information & communication (26), information security (29), information system (15), information technologies (11), institutional theory (23), knowledge (10), local government (16), management (17), performance (26), policy (19), project management (19), public e-services (10), public service (21), quality of service (10), smart cities (16), strategy (21) and sustanaibility (22)
3.	Third Cluster – 30 items	**E-government (2053), public administration (106), ict (92)**	Bureaucracy (26), business models (13), challenges (21), corruption (17), critical success factors (16), development (15), e-governance (87), e-government implementation (18), e-procurement (25), e-readiness (22), e-services (60), electronic governance (11), electronic government (10), european union (21), greece (12), information & communication (27), infrastructure (10), kazakhstan (11), new public management (19), public procurement (10), service delivery (20), stakeholders (16), strategic planning (11), transformation (20), transformational government (11) and turkey (17) and uk (10)
4.	Fourth Cluster – 25 items	**Government (132), internet (115), local government (94)**	Africa (14), canada (11), communication technologies (66), democracy (27), electronic commerce (14), electronic government (11), governance (70), information architecture (10), information management (19), information society (21), information systems (47), innovation (34), online services (16),

			public policy (21), public sector organizations (16), public services (43), records management (20), service (14), simulation (10), sweden (18), technology (22) and united kingdom (16).
5.	Fifth Cluster – 23 items	**Social media (103), transparency (87), open government (60)**	Accountability (31), big data (36), collaboration (35), crowdsourcing (12), data mining (11), facebook (18), government 2.0 (13), government information (13), open data (48), open government data (12), open innovation (10), participation (24), personalization (10), smart city (30), smart government (15), social networks (15), stakeholder theory (10), text mining (12), twitter (16) and web 2.0 (31)
6.	Sixth Cluster – 20 items	**Electronic government (228), public sector (71), interoperability (70)**	Change management (17), e-learning (12), electronic services (19), enterprise architecture (21), framework (26), government policy (13), integration (32), it in public administration (13), knowledge management (35), ontologies (12), ontology (36), organizational change (17), semantic web (24), services (25), standards (12), web services (20) dan xml (14)
7.	Seventh Cluster – 20 items	**Digital divide (86), e-participation (73), e-democracy (69)**	Acceptance (10), accesibility (38), citizen participation (33), citizenship (11), civic engagement (11), digital democracy (11), disability (11), education (14), electronic democracy (11), good governance (21), information & communication (11), municipalities (14), saudi arabia (19), sub-saharan africa (13), usability (43), web accessibility (16) and websites (14)
8.	Eighth Cluster – 13 items	**E-commerce (37), information sharing (28), information (26)**	Communication (13), diffusion (18), e-business (24), e-government service (10), e-health (11), e-service (19), efficiency (13), ict (19), portal (14) and regulation (13)
9.	Nineth Cluster – 13 items	**Information technology (91), evaluation (41), benchmarking (29)**	Assessment (20), australia (13), it governance (10), maturity model (13), measurement (11), new zealand (12), public management (15), quality (22), trust in government (15) and websites (11)

10.	Tenth Cluster – 11 items	**Security (54), privacy (48), cloud computing (47)**	Authentication (15), blockchain (10), e-voting (27), electronic voting (11), identity management (14), performance evaluation (10), public value (28) and risk (16)
11.	Eleventh Cluster – 5 items	**Customer relationship management (13), g2c (12), municipality (12)**	Crm (10) and taiwan (10)

4.2. Countries of Author and Collaboration Visualization Using Vosviewer

In this section, a bibliometric analysis was conducted to analyze and visualize the countries of author that contributing to the areas of e-government research. There is a total of 183 countries found; however, only 83 countries met the threshold in Vosviewer. The minimum number of documents of a country was set by default of five (5) documents. Figure 9 shows the top ten countries with the highest publications.

Countries of author that contribute most publication in e-government research and their collaboration (RQ7)

The United States (USA) has the highest studies, among others, resulting in 929

publication, followed by the United Kingdom with 459 documents and China with 260 documents, et cetera. Malaysia is also included in the top ten countries with significant numbers of e-government research, leading in Southeast Asia region countries in publication quantities.

Figure 10 shows the collaboration of country's authors in e-government research areas. The circle connected to the other indicates the collaboration between the countries. The bigger size of the circle indicates the greater of the country's publication number. We can see that the USA has the most prominent circle among other countries, means they dominate the studies. They are the central point for e-government studies where other countries conducting e-goverment studies have a network with USA.
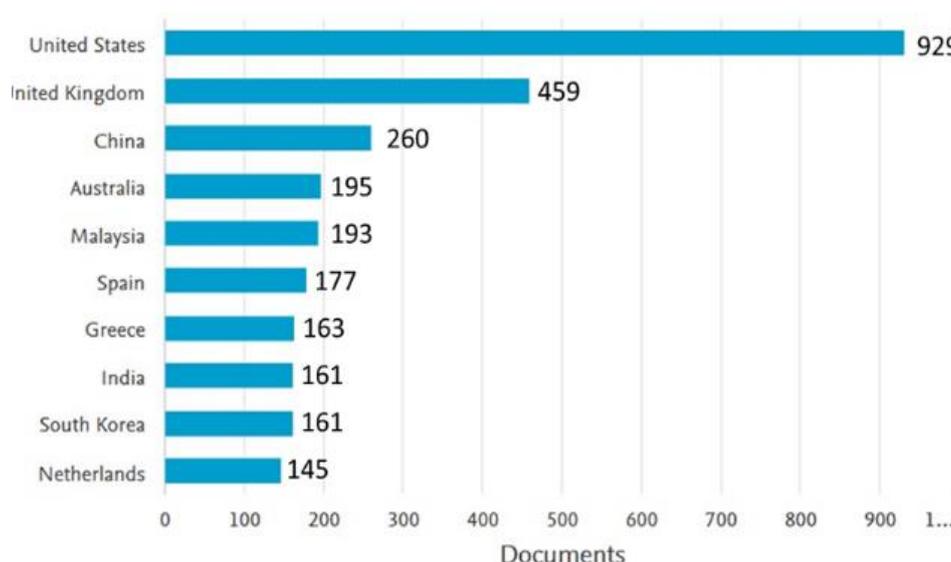

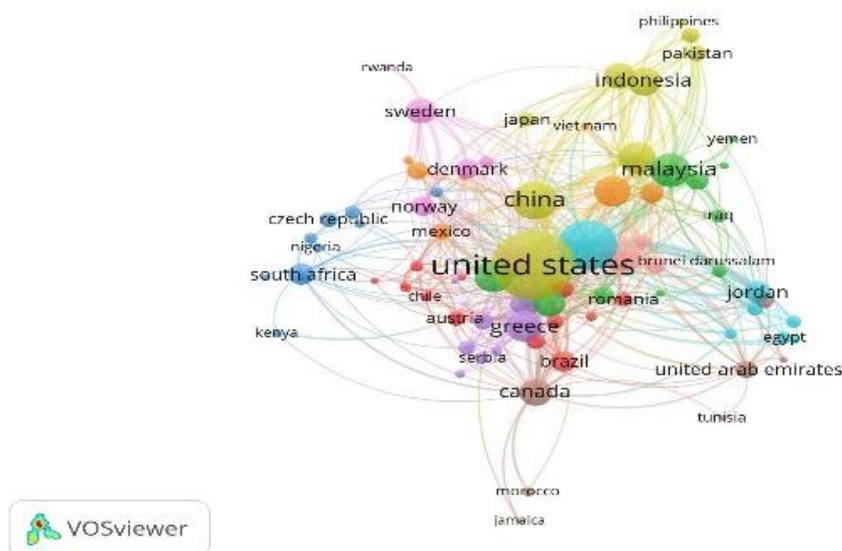**Figure 9.** Top Ten Countries of Author based on Publication Number

Figure 10. Country Collaboration of Authors Visualization

The influential articles based on citation measures in e-government research (RQ8)

Our study shows that scopus journals have a substantial impact on metrics related to citations. Table 3 shows the most cited articles in e-government research areas, and we limit the result to only the top five articles that have the highest citation among others. The total number of citations is used to determine the most influential articles as shown in Table 3.

The article written by Layne & Lee has been cited 1,490 times representing the highest cited article overall in this field. This article was entitled "Developing fully functional E-government: A four stage model" which published in 2001 (Layne & Lee, 2001). This article is said to be the most influential articles in e-government literature. Otherwise, the article was written by Bertot et al. in 2010 (Bertot, Jaeger, & Grimes, 2010) entitled "Using ICTs to create a culture of transparency: e-government and social media as openness and anti-corruption tools for societies" is the most popular article since it has the highest average citation per year (102.7).

Table 3. Top Ten Influential Articles: Citations Measure

No	Author	Year	Title	Citation	Cit./Year
1.	Layne & Lee (Layne & Lee, 2001)	2001	"Developing fully functional e-government: A four stage model"	1490	78.42
2.	Moon, M.J (Moon, 2002)	2002	"The evolution of E-government among municipalities: Rhetoric or reality?"	1156	64.22
3.	Carter & Belanger (Carter & Bélanger, 2005)	2005	"The utilization of e-government services: Citizen trust, innovation and acceptance factors"	1131	75.40

4.	Bertot, et al (Bertot et al., 2010)	2010	"Using ICTs to create a culture of transparency: e-government and social media as openness and anti-corruption tools for societies"	1027	102.7
5.	West, D.M (West, 2004)	2004	"E-government and the transformation of service delivery and citizen attitudes"	863	53.93

4. CONCLUSIONS

This study employs bibliometric analysis to review all peer-reviewed journals from the scopus database in e-government research areas. E-government literature has increasingly raised each year which was marked by enormous penetration of ICT in the public sector. E-government research has advanced and displayed a significant amount of literatures over 40 years but it has not arrived at the stage of maturity. According to the result, at the initial result stage, obtained as much as 14.892 dataset from scopus database, which diminished to 4322 dataset after the refinement refers to the specified inclusion criteria. The result of this study show the trends of e-government research, publication outlets (peer-reviewed journals), contributing authors, subject areas or discipline, productive countries and most influential article. Furthermore, cluster analysis shows the main research topics in e-government field based on its unique association of the set of keywords within the cluster; meanwhile the analyis of keywords with less frequent occurence indicate the potential topics for future study as contribution of this study.

Another contribution of this study is to fill the gap since there is no bibliometric analysis conducted to analyze e-government literatures in the last decade. Thus this study also intended to update and enrich the bibliometric analysis because there has been a significant increase in e-government research after 2010. The Vosviewer application had been successfully demonstrated in mapping and visualizing the bibliometric data; this is another contribution of this research due to the limited use of Vosviewer in bibliometric analysis of e-government literature. The limitation of this study is datasets only taken from scopus database especially peer-reviewed journals as resources. Thus, we recommend that further research should use various electronic databases such as Web of Science (WoS), Springer, IEEE Xplore et cetera in order to get more good scientific contributions. Besides, the result of bibliometric analysis needs to be compared with other different method such as Hitscite dan BibExcel to avoid the subjective assessment of authors.

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