



Range of Publications for E-Government Services: a Review and Bibliometric Analysis

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Abstract

With the rapid advancement of information and communication technology (ICT), public administration has adopted the concept of e-government. The academic literature produced many studies in the field of E-government (E-GOV) services, however, there is limited research on such services from the perspective of bibliometric and Network analysis. Therefore, this study aims to present a bibliometric and network analysis of the E-government services literature review obtained from the Scopus database, published between 2011 to 2021. This study uses a five-step method including (1) defining keywords, (2) initializing search outcomes, (3) inclusion and exclusion of some elements of the initial result, (4) compiling initial data statistics, and (5) undertaking analysis of data. The analysis starts by identifying more than 4,880 published articles related to E-government services published between 2011 and 2021. The study findings revealed that the highest number of publications on the E-government Service was in 2019 (102 articles), the top contributing affiliation was Brunel University London, the leading influential country was the USA, and the top contributing Source was Electronic Government. Furthermore, Lu J. occupied the first rank in the list of the most influential authors in terms of citations, while Weerakkody V. occupied the list of the top authors with high publications 20 papers. Likewise, this study showed that there is a collaboration among some authors. This research identified four research clusters by which researchers could be encouraged to widen the research of E-government services in the future. The bibliometric and network analysis of E-government services helps to graphically display the publication's assessment over time and identify domains of current studies' interests and potential directions for further studies. Finally, this research draws a roadmap for future investigation into E-government services.

Keywords: E-government; Public e-services; Bibliometric analysis; Network analysis; E-government Research.

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Introduction

The emergence of the World Wide Web (WWW) has led to a revolution in how organizations, individuals, and governments perform their tasks. In the last few years, there has been an increase in advice from international organizations and motivating governments to utilize modern technologies, leading to the development and betterment of governments and enhancing integrity, transparency, and all principles of good governance (Janita & Miranda, 2018). E-government services refer to the services delivered by government bodies to stakeholders or any government service that can be accessed electronically. Accordingly, the use of information and communication technologies (ICTs) by government entities is called E-government, which is a short form for Electronic Government; today, it has another name Digital Government.

E-government emerged as the central intermediary for citizens' delivery, management, and service (Avotra, Chengang, Sandra Marcelline, Asad, & Yingfei, 2021). Governments in the world of all sizes and types over the past 20 years have adopted a system of information and communication technologies (ICTs). They have worked hard to adopt and adapt it for many subjective reasons such as to be more responsive, more modernized, more efficient, more available to the stakeholders, to better manage public problems, and to support innovation and creativity. Today, governments spend billions on ICTs for citizen services, internal management, and regulatory activities. All levels of the government worldwide - municipal, regional, and national - attempt to adopt ICTs, sometimes, this goal is achieved, and in some cases, it is not (Gil-Garcia, 2012).

E-government Services development depends on several factors, including information technology, public trust, infrastructure, legislative willingness, human resources management (HRM), and scientific research. E-government facilitates the participation of citizens in government decision-making, increases awareness of citizens toward their rights and duties, and toward government activities, enhances the widespread transparency and integrity in government agencies, and the most crucial role is that it can reduce some manifestations of corruption in a State (Avotra et al., 2021). The E-government system has been adopted by all governments around the world but at different levels and qualities. E-government literature has increased in the number of research publications and continuously growing (Napitupulu, 2021).

The crucial role of ICTs implementations has boosted the attention and concerns of many researchers and scholars worldwide. Several researchers and academicians have reviewed and analysed E-government literature with dissimilar objectives including Gil-García & Pardo, 2005; Saeed, 2017; Wastiau et al., 2013; Lin, Fofanah, & Liang, 2011; Nam, 2018; and Alzahrani, Al-Karaghoul, & Weerakkody, 2017. They have discussed different issues related to E-government but according to the review of literature, bibliometric and network analyses for the term E-government Services are not yet available. Therefore, this work is significant for presenting bibliometric and network analyses of E-government Services scientific research publications in the Scopus database through 10 years from 2011 to 2021, likewise to identify the established and emerging field of E-government services research and to explore the decrease or increase of scientific production. Network analysis through bibliometric instruments has several benefits. It proves powerful for identifying established and emerging topical fields, it helps to identify the clusters of studies and research, and bibliometric analysis shows the most influential author (Fahimnia, Sarkis, & Davarzani, 2015). The main objective of this work is to explore the current condition of E-government services research through bibliometric and network analysis. In other words, the purpose of this study is to provide extensive bibliometric and network analyses of trends in E-government services literature by answering the following research questions:

RQ1: How have the E-government services trends seemed in the last ten years?

RQ2: What are the top five journals contributing to publications of E-government services in the last ten years?

RQ3: Who are the top ten researchers contributing to E-government services publications?

RQ4: What are the most influential affiliations in E-government services in the last ten years?

RQ5: Who are the highest cited authors in E-government services in the last ten years?

Literature Review

In this part, the literature review will be reported by discussing E-government Services and M-government, followed by the conceptualization of bibliometric analysis.

E-government services

Before the establishment of the E-government services system, the delivery of government services fully depended on classical offline services. In other words, it was a kind of service where citizens and government staff kept communicating face to face. However, the system of E-government services is a kind of online service where citizens do not need to meet with government staff face to face; it runs via internet technology. Online service systems improve management efficiency, reduce cost, promote synergy between several departments, and save time (Fan & Yang, 2015). There are various definitions of the term E-government. Still, the

majority of these conceptualizations focus on the role of ICTs (information and communication technologies) in facilitating the delivery of government services to government departments (G2G), businesses (G2B), and Citizens (G2C) (Al-Hadidi & Rezgui, 2010), in addition to the previous aspects of E-government services receivers, there is G2E which means government-to-employees (Baker El-Ebiary et al., 2020). E-government can be viewed as a process of enhancing the connection between governments and their stakeholders, including businesses and citizens, by using ICTs (Sabani, Deng, & Thai, 2018).

M-government services

United Nations defined E-government as the utilization of information and communication technologies and their applications by government entities to deliver public services and provide information. Governments are using modernization procedures for reengineering their services to provide online public services. On the contrary, citizens are cynical about utilizing mobile applications for government services. However, mobile applications are considered one of the essential tools of Mobile Government (M-Government). Mobile applications are types of software apps that are developed to access information by using mobile phones (Sharma, Al-Badi, Rana, & Al-Azizi, 2018).

Many scholars have defined M-government. For example (Alshammari, Messom, & Cheung, 2021) defined it as a strategy and its enforcement, including the use of all types of wireless and mobile technology, devices, services, and applications for optimizing advantages to the stakeholders of E-government which include citizens government units and business. Likewise, M-government has been defined as offering public services involving transactions on mobile phones, personal digital assistants, and pagers. To enhance their services to be accessed by the large population, governments worldwide have adopted mobile technology as a modern channel for delivering services (Alshammari, Cheung, & Messom, 2018). M-government expands the area of service delivery, optimizes the level of information sharing, provides precision to users, and promotes stronger digital equality and less cost (Shamim Talukder, Chiong, Corbitt, & Bao, 2020). This study has dealt with M-government due to the strong connection between these two terms. From the definition of both terms, it can be concluded that the Mobile Government is a complementary sub-set of E-government. In contrast, E-government considers a cornerstone of M-government as several pieces of the research described (Al-Hadidi & Rezgui, 2010).

Conceptualization of Bibliometric Analysis:

For the first time, the word bibliometrics was used in the journal of documentation in December 1969 by Pritchard in the USA. He had an article with the title 'Bibliometric Description' (Broadus, 1987). Recently many researchers have defined the term bibliometric analysis; the following are examples:

Table 1. Definitions of bibliometrics analysis from four different references

N	Author (s) and year	Definition
1	Michael Hall (2011)	Bibliometric analysis is the statistical analysis of physically published documents that involve articles, books, and other publications
2	Fauzan & Jahja (2021)	The use of quantitative analysis to describe the patterns of publications in a specific scientific research area. It can be used in the evaluation of the quantity and quality of published research.
3	Thanuskodi (2011)	Counting and analysing various facets of written documents, in other words, it's the analysis of published units
4	Donthu, Kumar, Mukherjee, Pandey, & Lim (2021)	It is the method of analysing and exploring large volumes of scientific research data.

There is an agreement among all researchers that bibliometric analysis is about the quantitative analysis of publications. In other words, bibliometric research investigates the formal properties of a particular domain of knowledge by adopting statistical and mathematical methods.

Methodology

Literature reviews aim to map and assess the body of literature to identify the gaps in the study and highlight the limitations of the knowledge (Fahimnia et al., 2015). Therefore, structured literature reviews are completed via an iterative cycle of conceptualizing appropriate study keywords, examining the literature, and supplementing the analysis. Mishra, Gunasekaran, Papadopoulos, & Childe (2018) recommend a methodology of five steps to carry out a literature review; these steps are (1) scanning documents, (2) writing notes, (3) structuring the literature review, (4) writing the literature review, and (5) bibliography building. In a similar method, we employed the five-step methodology for data gathering and holistic evaluation of the area of the study (E-government services) to capture the most impactful research and deliver insights for current study interests. We also sought to provide directions for studies related to E-government in the future.

Keywords defining:

To confirm that the topic of the research was completely captured, we used three main keywords, namely E-government, E-governments, and E-government Services. The initial search captures the Scopus documents related to (E-government services) in their (title-abs-key (E-government and services) and pub year > 2011 and pub year < 2021 and (limit-to (pub stage , "final")) and (limit-to (doctype , "conference paper") or limit-to (doctype , "article") or limit-to (doctype , "chapter") or limit-to (doctype , "conferencereview") or limit-to (doctype , "review") or limit-to (doctype , "book") or limit-to (doctype , "editorial")) and (limit-to (exact keyword , "e-government") or limit-to

(exact keyword , "E-government services") or limit-to (exact keyword , "e-governments")) and (limit-to (language , "English")) and (limit-to (source type , "journal")).

Initial results

The required data were aggregated only from the Scopus database in November 2021. Scopus database is the biggest citation and abstract database, with more than 20,000 well-recognized peer-review journals. These journals belong to reputable publishers such as Emerald, Elsevier, Taylor and Frances, Informs, Inderscience, and Springer. Scopus articles cover several areas of knowledge such as technology, humanities, social sciences, applied sciences, and others. The database is more comprehensive than any other database, such as Web-of-Science (Mishra et al., 2018). The topic mentioned above was searched in the Scopus database by Title, Abstract, and Keywords of articles. The initial search resulted in 4,887 articles. These documents contained information about the title of the paper, author of the document, affiliation, keywords, abstract, and references.

Inclusion and exclusion of initial result

For refinement of the initial results, duplicates were eliminated, as some articles may present not less than one combination of keywords. Inclusion and exclusion criteria have been carried out to filter the irrelevant publications that are not related to E-government services. The obtained documents included articles, reviews, book chapters, conference papers, conference reviews, and editorials. The items that were eliminated are note, short survey, and retracted. The process of searching did not use geographical restrictions but used language restrictions. English was the only language included. The filtration operation resulted in 896 relevant documents related to E-government services, published over 10 years from 2011 to 2021. The result of the refinement search was exported in CSV and RIS for further analysis (CSV is the abbreviation of comma-separated values, whereas RIS is the abbreviation of research information System).

Initial data statistics

Figure 1 demonstrates the number of documents related to E-government services published by Scopus journals from 2011 to 2021. It showed changing publishing patterns. Accordingly, the growth of publications in E-government services is occurring. The initial statistics said that 167 journals indexed by Scopus contributed to publishing 685 papers related to E-government Services between 2011 and 2021. We found that five journals produced 229 of the identified papers, presenting around 33% of the total produced articles. Figure 2 demonstrates the Top five Sources (journals) in which the articles appeared. In addition, other source statistics were not shown in Figure 2. For instance, Decision support systems, Government Information Quarterly, and Information system journals appear on top of the

highest citation journals. The statistics show that these sources were cited by 762, 486, and 395 consecutively.

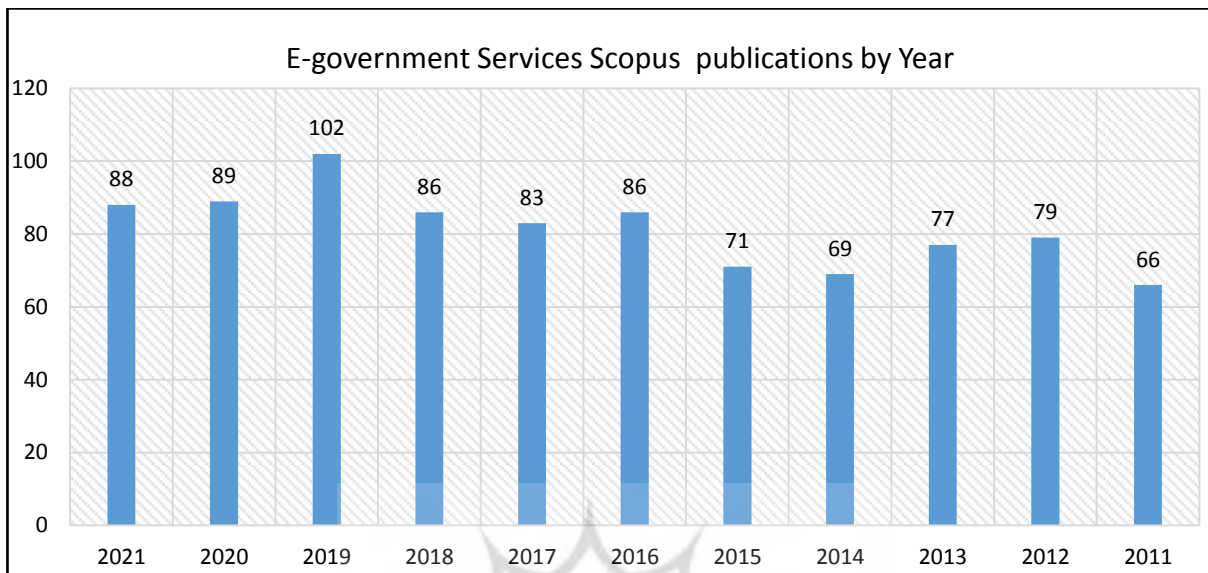


Figure 1. Publishing trend in the field of E-government services, source: Scopus database, 2021

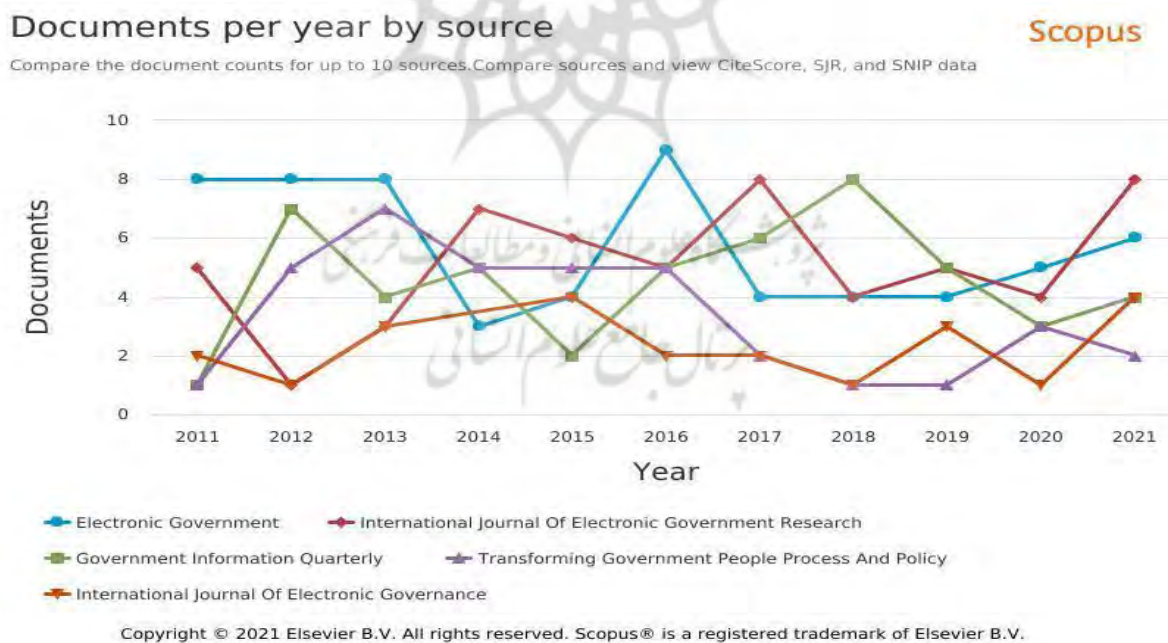


Figure 2. Top Five Scopus journals contributing to the field of E-government Services

Analysis of data

According to Fahimnia et al. (2015), the nature of citation analysis research needs an approach of induction; therefore, we adopted an inductive approach for this study's data analysis. Analysis of data is undertaken in two forms (1) Bibliometric analysis and (2) Network analysis. In Bibliometric analysis, BibExcel was used to provide additional data statistics, such as authors, affiliations, countries or regions, subjects, and others. BibExcel was selected because of its flexibility in dealing with huge datasets and its matching with different computer applications such as Gephi, Excel, and Pajek. Additionally, BibExcel is useful for the preparation of input data for Network Analysis (Mishra et al., 2018). The Network analysis section uses VOSviewer to create maps based on bibliometric data and determine the connections of publications via several terms such as authors and citations, co-authors and authors, co-occurrence, keywords, and other types of analysis. VOSviewer was chosen due to its unique attention to the graphical representation of bibliometric maps and its ability for scrolling, zooming, and searching (van Eck & Waltman, 2010).

Results

Bibliometric mapping is an important research topic in the area of bibliometric studies. Bibliometric mapping can be divided into (1) the construction of a Bibliometric map and (2) the graphical representation of maps. In the bibliometric literature, researchers are most interested in the construction of bibliometric maps, whereas the graphical representation of maps obtains less attention (Van Eck & Waltman, 2010). In the past, many software packages were used for Bibliometric analysis; each of these software packages has its limitations and capabilities. There are several tools for Bibliometric analysis, but the most popular instruments include HistCite, Publish or Perish, and Bibexcel. This study chose Bibexcel for Bibliometric analysis due to the flexibility of BibExcel for adjusting and modifying data that was imported from multi-databases such as Web of Science and Scopus. Also, BibExcel can provide complete data analysis for usage in tools of network analysis such as VOSviewer. In the above- section (Exclusion and inclusion), we mentioned that Scopus outputs were exported in the form of RIS. Therefore, the RIS form was used for input into BibExcel for analysis. Analysis of collected data focuses on the following aspects.



Figure 3. Aspects of assessment of extracted articles, Source: Author created by using NVivo12plus Mind Map

Author Influence

To analyse the frequency of a text occurrence in the dissimilar field of bibliometric data, we used Bib Excel. The authors' field was collected from the RIS data file, which was exported from the Scopus database for future analysis. Moreover, the frequency of the authors' occurrence was recorded. Table 1 demonstrates the top 10 authors that contributed to the area of E-government services with their total publications from 2011 to 2021. It can be seen that Weerakkody.V., with 20 publications, dominates the list of authors, followed by Dwivedi, Y.K., and Mensah, I.K., each of them with 14 publications. Additionally, the rest of the authors are contributing to the development of E-government services research.

Table 1. Contributing authors in E-government Services (2011-2021)

Author	Number of Publications
Weerakkody, V.	20
Dwivedi, Y.K.	14
Mensah, I.K.	14
Irani, Z.	10
Janssen, M.	8
Lee, H.	8
Nam, T.	8
Rana, N.P.	8
Abu-Shanab, E.	6
Abu-Shanab, E.A.	6

Affiliation statistics

The authors' affiliations were extracted from the RIS data file. According to table 2 calculations, Brunel University London occupies the top ten of selected partnerships, followed by Brunel Business school and Qatar University, then Yarmouk University. The University of Texas at San Antonio, Swansea University, Delft University of Technology, and Jiangxi University of Science and Technology have produced the same number of publications related to E-government Services.

Table 2. The top ten contributing affiliations in E-government services

NO	Affiliation	Number of Publications
1	Brunel University London	29
2	Brunel Business School	22
3	Qatar University	13
4	Yarmouk University	11
5	The University of Texas at San Antonio	9
6	Swansea University	9
7	Delft University of Technology	9
8	Jiangxi University of Science and Technology	9
9	Panepistimion Makedonias	8
10	University Utara Malaysia	8

Countries' Statistics

Documents by Country were extracted from the CSV file that was exported from the Scopus database. Figure 4 shows that the USA dominates the list of the top 10 countries contributing to publications related to E-government services, followed by the British. China occupied the third rank as a contributing country in the field of E-government Services. Additionally, it can be observed that Malaysia, India, Spain, Greece, Australia, Indonesia, and South Korea play a role in the production of E-government Services publications.

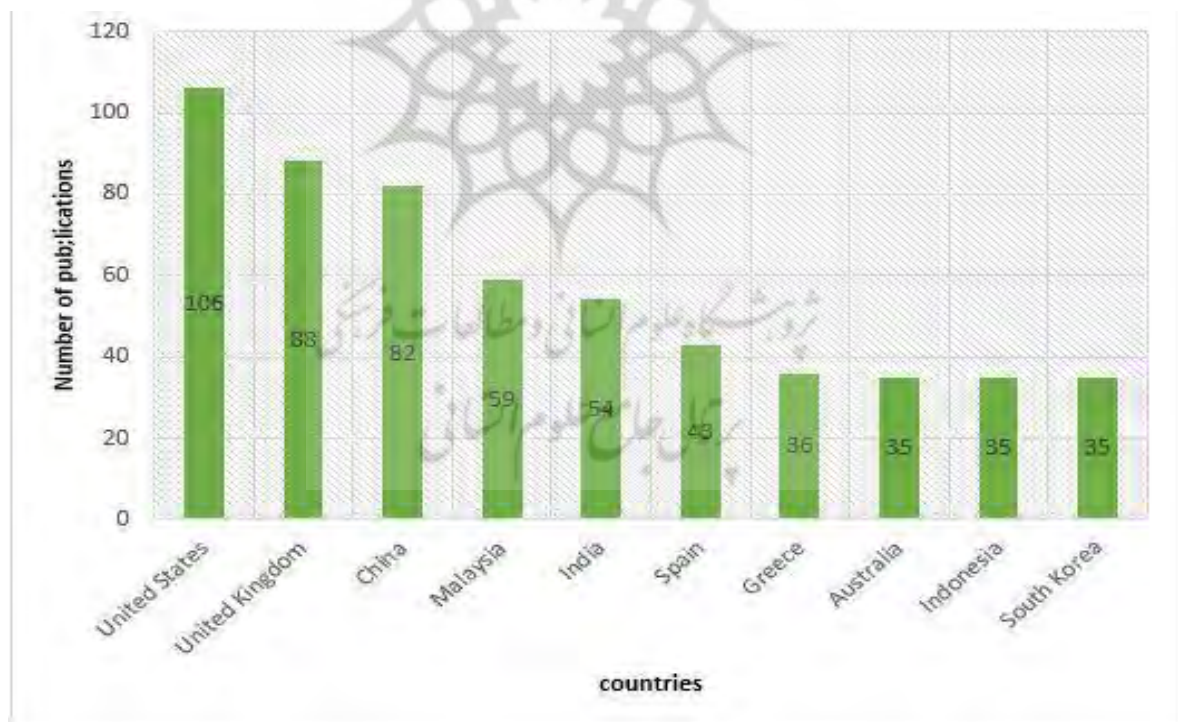


Figure 4. The top 10 countries contributed to E-government services publications, based on the Scopus database analysis

Network analysis

For undertaking network analysis, various tools are used for this purpose; the most popular ones preferred by the researchers are Histcite graph maker, Pajek, Gephi, and VOSviewer. VOSviewer was chosen for this study due to its visualization flexibility, and it can construct and view bibliometric maps. The software offers a text-mining function for building and visualizing connections/relationships. Via VOSviewer, researchers and scholars can display a big bibliometric map in a simple and easy style to explain connections among various elements (Nurdin, Hutagalung, Yulianto, Kurniawan, & Hermawan, 2021).

Citation analysis

Citation analysis is used to evaluate the frequency of citations; therefore, it is used for ranking journals and articles in their importance and contributions to a specific field of research. Additionally, citation analysis is used to rank scholars regarding the impact of their scientific research. Accordingly, citation analysis provides insights into the popularity of scientific production over time. Citation analysis can identify the most influential papers, authors, journals, countries, and organizations or affiliations (Mishra et al., 2018).

Table 3 describes the top 10 cited papers and authors in the field of E-government services published between 2011 and 2021. The most impactful paper during this period was the paper published by Lu, Wu, Mao, Wang, & Zhang (2015), which received 762 citations. Their article reviewed the developments of recommender system application (RSA); it clusters the systems of recommender applications into eight categories, namely, e-government, e-learning, e-group activities, e-shopping, e-business, e-tourism, and e-resource services. The document systematically explores the reported systems of recommenders through four dimensions: (1) methods of recommendation e.g., CF, (2) recommender systems software for an instance BizSeeker, (3) application platforms such as mobile-base-platforms, (4) real-world application domains such as e-business. Another paper that has a good contribution is the article written by Bertot, Jaeger, & Hansen (2012); their report received 486 citations which shows the influence of the paper in the area of E-government Services. Their paper examines the impact of policies on government agencies' utilization of social media in the USA; likewise, it investigates the challenges and issues of social media usage by government bodies in the USA.

Moreover, the article written by Venkatesh, Thong, Chan, Hu, & Brown (2011) occupied the third rank in the list of the top 10 citations; it's about the model of information system continuance. They conducted longitudinal field research on 3,159 Hong Kong Citizens across two E-government technologies that enable stakeholders to access public E-services. In general, the numbers of citations indicate the significance of the paper. Accordingly, we can

say that the sources of these top 10 articles highlight the influence of these papers in the field of E-government Services during this period (2011-2021).

Table 3. The top 10 authors with high citations, based on the Scopus database analysis

Author	Cited by	Year of publication
Lu J., Wu D., Mao M., Wang W., Zhang G.	762	2015
Bertot J.C., Jaeger P.T., Hansen D.	486	2012
Venkatesh V., Thong J.Y.L., Chan F.K.Y., Hu P.J.-H., Brown S.A.	395	1011
Sandoval-Almazan R., Gil-Garcia J.R.	200	2012
Weerakkody V., El-Haddadeh R., Al-Sobhi F., Shareef M.A., Dwivedi Y.K.	142	2013
Rana N.P., Dwivedi Y.K., Williams M.D., Weerakkody V.	136	2015
Elbahnasawy N.G.	129	2014
Rehman M., Esichaikul V., Kamal M.	118	2012
Lian J.-W.	117	2015
Karunasena K., Deng H.	117	2012

Linkage and clustering of topics in E-government services

In this part, we visualize several terminologies that relate to the theme of this study. Around 116 related terms were identified by using VOSviewer. The software divided those terms into four (4) clusters, each cluster containing several terms with different occurrences. The clusters are identified by colours, Red, Green, Yellow, and blue. The purpose of this map is to identify the concepts used in previous studies and to identify the topics that may be used for future studies. In cluster I, about 64 themes have relations such as access, application, platforms, and other terms. The related themes in cluster II are about 36 themes, including E-government services, models, factors, and other terms. Additionally, cluster III consists of 9 items involving accessibility, websites, and others. Whereas cluster IV contains seven items: customer, delivery, project, and others. Briefly, the concepts with many links show that there are many articles have been written about them from different perspectives, such as E-government services and applications, whereas; concepts with few links refer to that, there is less attention paid to that area of study, which could be used for future researches such as the digital economy and digital transformation.

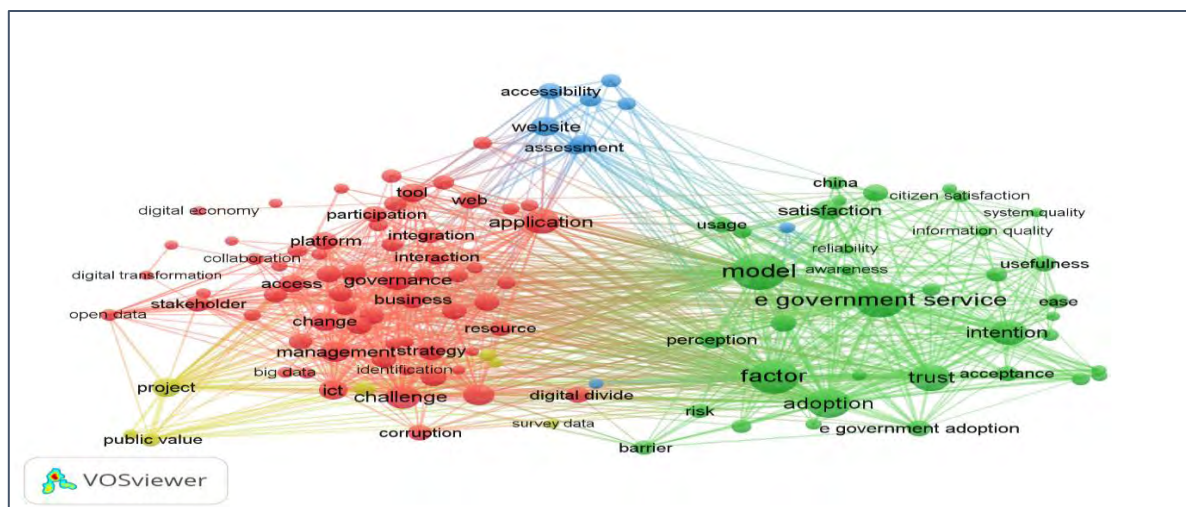


Figure 5. Connections of themes in E-government services studies, map based on text data

Keywords occurrence network

The network of keyword occurrences reflects research trends of a particular domain and study hotspots (Tang, Liao, Wan, Herrera-Viedma, & Rosen, 2018). A similar analysis is used to identify the phrases or words frequently used in the titles of targeted papers or the list of keywords. Discussion of keywords assists in identifying the construction of a particular field of the study by looking into keywords used in the articles. Also, keywords reveal the intellectual core of the content.

According to the results of the VOSviewer analysis, there are 3855 keywords in all articles related to e-government. When the minimum number of occurrences of keywords was 5, 240 keywords met the threshold. To select the most trending keywords, we increased the minimum number of keyword occurrences to 23. We obtain 30 keywords that meet the threshold, among a total of 3855 keywords. According to figure 5, VOSviewer divided the top 30 keywords into four clusters. Cluster (1) is characterized by items/keywords coloured red. The huge node is E-government which is the major issue of this study. Cluster (2) is identified with blue, cluster (3) is with green, and finally, cluster (4) is with yellow. According to figure 5, it can be observed that each cluster consists of nodes (keywords) that possess strong relations among them in the structure of the map. In each cluster, there are keywords whose rate of frequency is higher; it shows the focus of the studies that have been conducted previously. Take an example, cluster I has the most occurrence items: E-government (884), cluster II with digital divide (32), cluster III E-government data processing with (132) frequencies, and E-government Services (129), and cluster IV has developing countries (41). Each cluster in table 4 and figure 5 portrays a significant topic as a research trend in the field of E-government, based on its connection with keywords in the cluster. Keywords in every cluster describe a research stream.

The top 30 keywords that are used in the titles of articles or the list of keywords are summarized in table 4. The most common keyword in table 4 (E-government) occurs many times because it was used as one of the major search keywords in this study, as well as E-government services and E-governments.

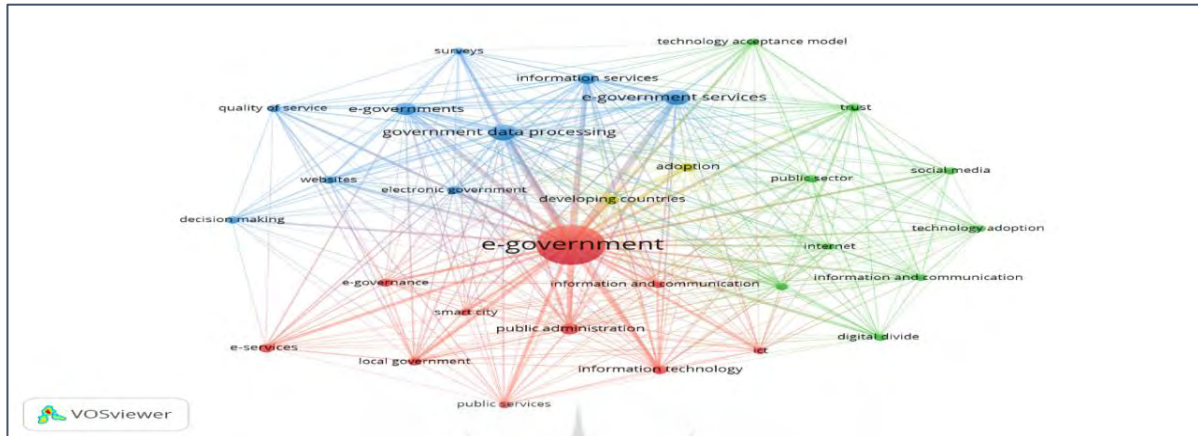


Figure 5. VOSviewer analysis of the top 30 Keyword occurrences

Table 4. The top 30 keywords (4 clusters) used in the published E-government services articles

Cluster	Keywords	Frequency	Total link strengths
Cluster1	E-government	884	1117
	E-governance	34	77
	E-services	40	82
	ICT	27	76
	Information and communication technologies	31	104
	Public administration	62	163
	Local Government	36	100
	Public services	42	75
Cluster 2	Smart city	23	52
	Digital divide	32	72
	Government	29	95
	Information and communication technology	26	89
	Internet	24	81
	Public sector	28	81
	Social media	30	63
	Technology acceptance model	25	78
Cluster 3	Technology adoption	23	63
	trust	26	82
	Decision making	28	63
	E-government services	129	328
	e-governments	80	287
	Electronic government	39	113
	Government data processing	132	76
	Information services	28	229
Cluster 4	Quality of service	29	94
	Surveys	26	82
Cluster 4	Websites	38	115
	Adoption	40	99
Cluster 4	Developing countries	41	121

Co-author analysis

It is not easy for a person to complete research on a particular subject alone. Many scientific research projects need collaborative strength to be accomplished. Co-authorship research is a leading content of bibliometrics. The level of research cooperation is an index to evaluate the current condition of research in a particular study area (Liao et al., 2018). In this part, we mainly present the authors' and organizations' co-authorship analysis. We make the co-authorship analysis by using VOSviewer software. Figure 6 and figure 7 display co-authorship analysis, the unit of analysis are Authors and organizations.

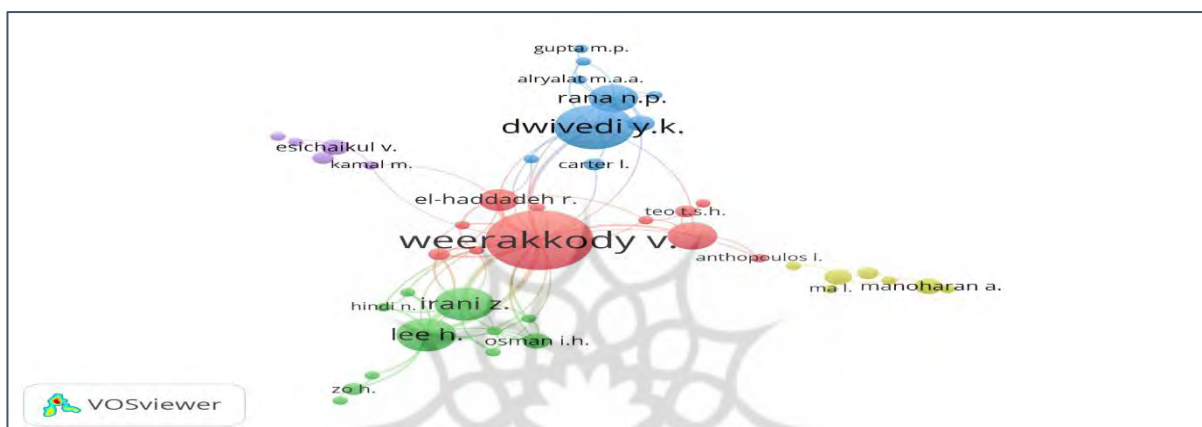


Figure 6. Network visualization map of co-authorship

Unit of analysis= author

Counting method= fractioning

Minimum number of documents of an author =2

Minimum number of citations of an author =5

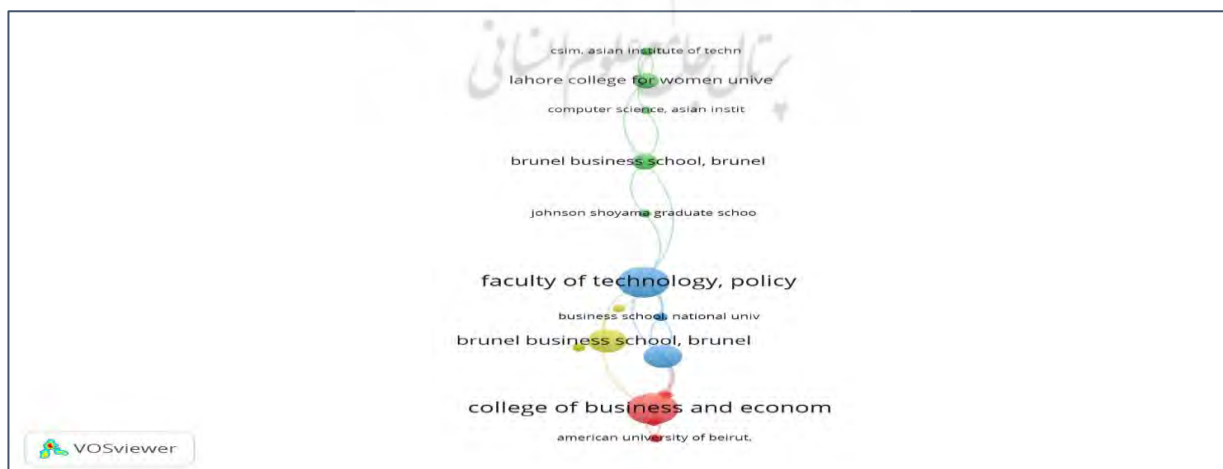


Figure 7. Map of Network visualization of co-authorship

Unit of analysis= organizations

Counting method= fractioning

Minimum number of documents of an organization = 1

Minimum number of citations of an organization =4

Conclusion

This research aimed to review and investigate trends of research production in the area of E-government services over 10 years by employing bibliometric and network analysis. There have been around 4,887 articles related to E-government services published by journals indexed in the Scopus database between 2011-2021. Although there are many literature reviews on E-government services, bibliometric and network analysis to objectively and analytically identify the most impactful authors, the most influential publications, clusters of emergent studies, and collaborations of authors seem exiguous. This provides an assessment of the effective documents and other evaluation elements and it contributes to the study area by mapping the connections among the higher influential papers.

The findings of this study reveal the trends of publications in the field of Government services. The results show the development of the research in the area of E-government services, the contributions of organizations, and the contributions of countries in publications. Many impactful publications have occurred from 2015 to 2019. The study shows that the highest production of E-government services research was in 2019; the most influential source was Electronic Government, the author with the highest number of publications was Weerakkody, V, the authors with the highest number of citations were Lu J., Wu D., Mao M., Wang W., Zhang G, the most contributing affiliation in the field of E-government services was Brunel University in London, and the geographical distribution of publications showed that the most influential country in the field of E-government services was the USA.

For future studies, this research has identified part of the recent works in E-government services, which can be used to identify potentially influential articles. Identification of influential scholars in E-government services is essential to set the stage for further research. Table 4 shows the cluster analysis; it describes the major research issues in the field of E-government services based on the strong connection of keywords in the cluster. In comparison, keywords analysis can be interpreted as keywords with few frequencies indicating the potential subjects (topics) for future studies. It's one of the contributions of this research. Another contribution of this study is the successful use of VOSviewer for network analysis. There are minimal studies of E-government services that employ VOSviewer as a tool for network analysis. This study draws a roadmap for the conduction of Bibliometric and Network research by using VOSviewer Software.

No doubt, there is a limitation in how the results of this study are organized and presented. There were aspects of evaluation that are not included in this research, such as the language of the articles (we only included English), document type (we only had reports), publication stage (we only included final), and funding sponsor. This study selected VOSviewer as a tool for network analysis, although there are many other tools. This research has abstracted data from the Scopus database only; therefore, this study recommends that future studies can use other databases such as Publish or Perish, Web of Science, IEEE Xplore, and Springer to develop the research. On top of that, we recommend that future researchers use other Network analysis tools such as Gephi, Pajec, and HistCite (only accept data from Web of Sciences).

Conflict of interest

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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