ISSN: 0067-2904

Cloud-Based E-Government (CBEG): A Systematic Literature Review

Wissam H. S. Alkhilani [1]*, Rodziah Binti Atan[1,2], Salfarina Binti Abdullah[1] & Yusmadi Yah Bt Jusoh[1]

[1]*Software Engineering and Information Systems, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia, Malaysia*

[2]*Laboratory of Halal Policy and Management, Halal Products Research Institute, Universiti Putra Malaysia, Malaysia*

Received: 25/10/2022 Accepted: 17/4/2023 Published: 30/4/2024

Abstract

The field of cloud-based electronic government (CBEG) is still expanding. Some conflicting results have been published regarding the factors influencing the adoption of CBEG. The paper aims to review the literature and understand the status of CBEG and the factors behind its adoption. Specific keywords related to the topic were used to extract articles from reliable databases. An extensive review was done on a total of 41 articles published between 2016 and August 2022. The findings showed that there has been an increase in the number of articles related to CBEG, specifically in the public sector. The review also showed that the quantitative approach outperformed other approaches. The Technology Organization Environment (TOE) framework and Diffusion of Innovation (DOI) were used in the majority of the reviewed papers. Structural equation modeling (SEM) was applied intensively in the reviewed papers. The most important factors for CBEG adoption are top-level management support, security, compatibility, relative advantage, complexity, and privacy. Future studies are recommended to expand the scope of inclusion criteria, conduct more empirical studies on CBEG, and deploy mediators and moderators. Empirically, combining more theories can explain more about the adoption of CBEG. The findings help decision-makers better understand the predictors of the successful adoption of CBEG.

Keywords: Cloud-Based E-government (CBEG), Cloud Computing (CC), E-government

1. Introduction

Electronic government (E-government) is important as it can facilitate various online services for the benefit of the citizens. However, the functionality of e-government in several countries has been severely criticized. E-government projects in developing countries are considered in their early stages, with only 15% of e-government projects considered successful, while 50% are partially failed [1]–[3]. For these reasons, several papers attempt to understand the reasons behind the failure and the predictors of successful e-government adoption. Nevertheless, the results of prior papers suggested that there were mixed findings in terms of the challenges that confront the E-government projects, and these mainly related to the infrastructure and networks [4, 5].

To address this, researchers have shifted their attention to cloud-based e-government (CBEG). The advantages of cloud computing (CC) have encouraged governments all over the

* Email: gs58276@student.upm.edu.my

world to adopt this technology so that reliable and sustainable e-services can be delivered. The e-services can be effectively delivered and sustained through the implementation of robust, integrated back-end processes using CC with consideration of appropriate levels of data portability, interoperability, and security [6]. Several cases provide evidence that CC has become a strategic direction for many governments. It has already been adopted to make many e-government services effective [2–5]. With the mounting difficulties surrounding the current economic situation, governments are trying to boost their services and reduce ICT costs by using cloud platforms. Many public organizations have also joined the bandwagon in using cloud services to address many existing ICT-related problems, such as cutting costs and encouraging work on scalability, availability, and accessibility. CC has also been adopted to make the e-services more efficient and of better quality, as well as to make them more transparent and have more citizen participation [6–10].

From a theoretical perspective, the papers on e-government and CBEG are still not clear on which model is more effective in predicting adoption. The previous literature on CBEG utilized a single framework like the Technology Organization Environment (TOE), the Unified Theory of Acceptance and Use of Technology (UTAUT), the Social Exchange Theory (SET), the Technology Acceptance Model (TAM), the Diffusion of Innovation (DOI), and the Theory of Reasoned Action (TRA). In addition, while past studies concentrated on CBEG in developed countries, a few studies have looked into it in developing countries [11–14].

The move to CBEG may prove to be a good action for the citizens and the government. CBEG is "*a new e-government paradigm that incorporates the characteristics of CC such as broad network access, resource pooling, on-demand self-service, rapid elasticity, and measured service*" [20, 21]. CBEG enables the sharing among partner organizations in terms of the ICT facilities, systems, and business processes of services, and this ultimately reduces the operational cost of an organization. The CBEG system had tremendously improved resource utilization [19], [22]. On the other side, the adoption of CBEG carries many issues that might become obstacles to its implementation. These challenges are different from one country to another. A review paper dealt with the challenges and issues of adopting e-government in developing countries. The paper was limited to the context of developing countries [2]. CBEG is still a newly emerging topic, and there are few papers that concern the factors determining CBEG adoption. Further, the paper on moving to CC technology is still limited [23]. A systematic literature review (SLR) noted that there was a lack of studies in CBEG [7].

In addition, prior literature had emphasized the practice and adoption of cloud computing in the private sectors (health care, education, industry, and small and medium enterprises), while few examined its implications in the public sector. In this paper, CBEG is described as a cloud adoption of e-government in the public sector. Previous studies were mostly on the exploratory, reviewing, and conceptual levels. There is a scarcity of empirical studies on CBEG. Therefore, the objectives of this paper are to conduct a systematic literature review (SLR) of the factors that impact the adoption of CBEG, to decide upon the most important factors, and finally to categorize them as technological, organizational, environmental, or individual in nature. This paper focuses on the existing literature on CC as a supporting technology for e-governments, and several aspects will be under the spotlight, including the themes, methodologies, trends, critical factors, theories, and data analysis techniques in past studies. At the same time, it offers some great contributions to the researchers wishing to delve into CC and e-governments in their future papers. The paper also provides decision-makers with a better understanding of the predictors of adopting CBEG. The organization of the paper encompasses the introduction,

paper methodology, literature review, findings of the paper, discussion, implication, limitation, future work, and conclusion.

2. Paper Methodology

A systematic literature review was conducted based on methodology adapted from [24]. Academic studies were reviewed using search engines in Science Direct, IEEE Xplore, Web of Science, Emerald, Scopus, and Google Scholar. The keywords for the search criteria included "Cloud-Based E-Government (CBEG)" or "CBEG" or "Cloud Computing E-Government"; "Cloud Computing (CC)" and "E-government"; "Electronic government" or "EG"; "Adoption of CC services" and "usage of CC";

The criteria for inclusion are journal articles published between 2016 and August 2022 and written in English. Inclusion criteria taken into account in the search are: (1) behavioral studies encompassing conceptual and empirical findings (2) studies probing e-government implementation, and (3) CC adoption in public sectors. The exclusion criteria, on the other hand, are: (1) all technical studies; (2) studies unrelated to e-government or the public sector; and (3) studies that did not look into factors underlying CC adoption in the English language.

In total, 187 studies were selected by looking at their titles in IEEE Xplore, ScienceDirect, Web of Science, Google Scholar, Scopus, and Emerald. From these 187 studies, a total of 86 articles were removed based on the time of publication. Further, non-English articles and duplicated articles were removed. Technical papers that are related to the hardware, software, applications, and networks were excluded. Lastly, based on a full reading of the articles, a total of 10 papers were removed. As a result, only 41 papers are considered valid. Figure 1 summarizes the process of selecting articles for the SLR conducted in this paper.

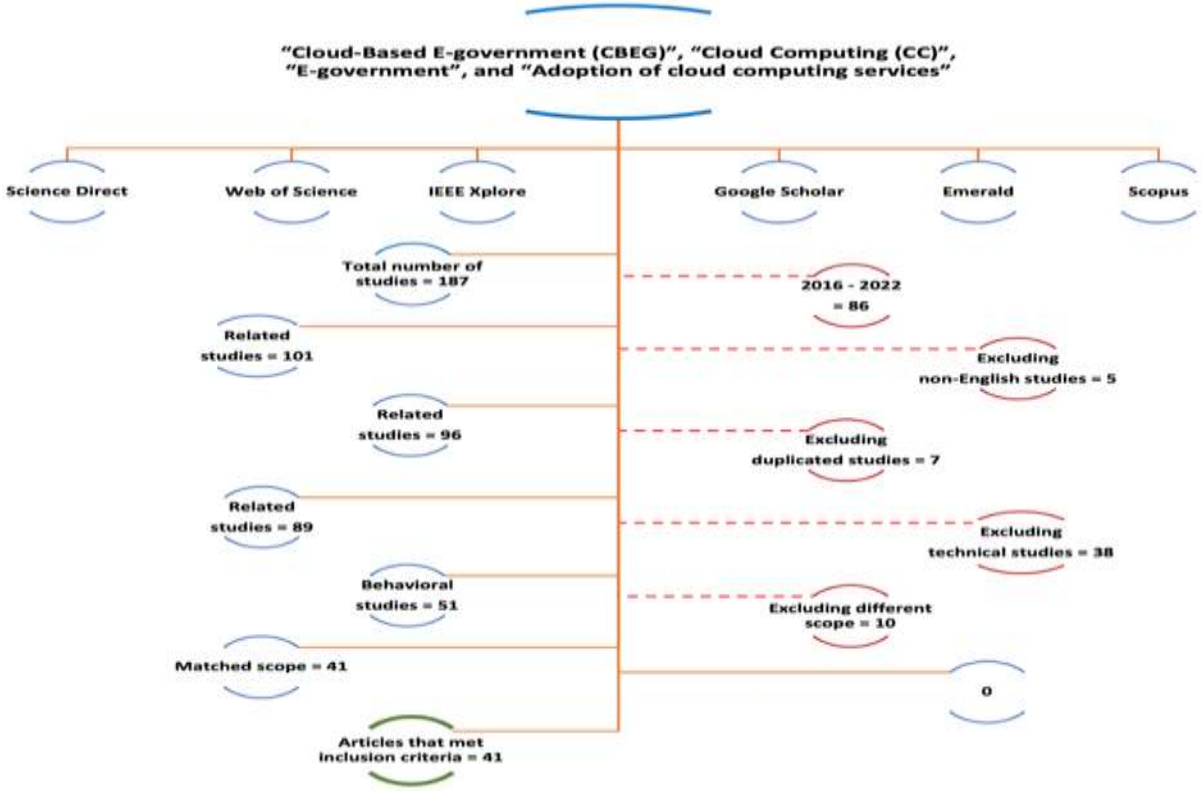

Figure 1: Process for selecting articles

3. Literature review

This section discusses, in brief, the literature review of this paper. The section primarily includes e-government, CC, and CBEG, as well as a brief summary of the reviewed articles.

3.1 E-government

Governments all over the world are continuously on the lookout for ways to boost their service fields [25]. Therefore, there is a demand for restructuring processes and effective use of technology to make the public and private sectors perform better as they are becoming more efficient and effective [26]. E-government is the term coined to describe the utilization of information technology (IT), information and communication technologies (ICTs), and other web-based telecommunication technologies. The aim is to improve and/or enhance the efficiency and effectiveness of service delivery that can benefit various parties, including the public sector, businesses, citizens, and employees [27, 28].

There are different measures of the success of e-government projects between countries. A percentage of 60% of e-government projects are regarded as either a complete failure or a partial success [29], [30]. There are many tiers or stages in the development of e-government projects. Most stages kickstart with the web presence, and then they take it a step further by enhancing the web presence, communicating with citizens, and finally being involved in transactions with citizens. The success rate of e-government adoption differs from one country to another. In developed regions, around 25% of e-government projects seem to stall, and even 33% have failed to mature according to the initial planning of the project [31]. As far as developing countries are concerned, 35% of e-government systems' implementation is deemed a complete failure, 50% a partly failure, and only 15% of e-government projects can be regarded as successful [1]–[3]. As a result, several researchers brought the move to CC to address the challenges of e-government and improve services for citizens [32]–[34].

3.2 Cloud computing

CC has received much attention from researchers and practitioners since it first started in 2007. Recently, CC, or more specifically, its services and applications, have been extensively used by many governments to improve their implementation, integration, and service delivery for citizens [7], [22]. CC is widely defined by researchers based on the definition given by the National Institute of Standards and Technology (NIST), which is "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction" [17], [35]–[38].

The provision of CC comes in the form of three service delivery models and four deployment models. Infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) [39]. The four deployments are public cloud, private cloud, community cloud, and hybrid cloud [8]. All these types offer many kinds of services for users, some free and some others purchased [11], [40]–[45]. The features of CC define their functions and the advantages obtainable by organizations. One of the most important benefits of CC is online storage as a technology framework [46]. In this way, networks can be used to connect servers and storage devices, which helps organizations adopt good storage solutions. In addition, it offers the ability to assist customers around the world with online service providers in order to turn their aspirations into achievements by making use of the efficiency and speed of the Internet [8]. The CC concept enables users to gain access to information and data at any time, from anywhere,

without restrictions or requirements for the hardware equipment [16]. Therefore, with the integration of the CC with e-government, CBEG can definitely provide better services [47].

3.3 Cloud-based e-government

Cloud-based e-government (CBEG) offers several advantages, such as scalability and the use of software, hardware, and applications on a demand basis [13]. Several countries, i.e., Japan, the US, the EU, and the UK, have started paying attention to CBEG to consolidate the public services and increase the service provided to citizens and organizations in the country. Not only developed countries, but other developing countries have also started using CBEG services [48, 49].

Potential benefits of CBEG include the fact that it can save costs, enhance services, and make them more efficient and valuable [13], [50], and [51]. Other than getting benefits from CC characteristics like mobile access, resource pooling, rapid elasticity, on-demand self-service, measured service, automatic backup and recovery, and flexibility [10], [26] stated that e-government can provide dynamic scalability, distributed storage, accountability, management, and green IT fields [52]. In the next section, a summary of the studies related to CBEG is provided.

3.4 Technology Organization Environment Framework (TOE)

In the literature, there are few studies that investigate CC as far as e-government is concerned. One of the widely used models is the technology-organization-environment framework (TOE). The authors in [53] deployed TOE to look into the determinants of CC adoption. The findings highlight the fact that relative advantage, security concern, top management support, technology readiness, competitive pressure, and trading partners' pressure were the TOE factors significant in CCA in a developing country. Conversely, firm size, scope, compatibility, and regulatory support were discovered to be insignificant. Similarly, [54] revealed that security, privacy, and data loss represented the technology, organization, and environmental factors that are significant in CC adoption in a developing country context. Some advantages that motivate the adoption of this paradigm in these countries have also been noted. In addition, relative advantage, compatibility, security, and cloud knowledge are strong influences on the use of CC technologies.

The authors in [55] developed a theoretical framework by combining individual dimensions and different context-specific constructs with the TOE framework. Findings reveal that the effects of the relative advantage, service quality, perceived risks, top management support, facilitating conditions, cloud providers' influence, server location, computer self-efficacy, and resistance to change are significant in the adoption of CC. Additionally, the effect of social influence on the adoption of CC is insignificant. Also, [56] deployed TOE and used multi-criteria decision-making (MCDM). The result shows that factors in the technological and organizational dimensions are the reasons for the adoption of cloud technology in the semiconductor industry. A study by [44] mentioned that in Australia, the technique for ordering preference by similarity to the ideal solution (TOPSIS) was used, and the TOE framework was relied upon to determine a set of appropriate criteria. The findings illustrate that the relative advantages of complexity, reliability, security, and privacy in a technological context, organization readiness, firm size, and top management support in an organizational context, and competitive pressure in an environmental context are significant factors in CC adoption for SMEs. The authors in [57] studied the factors influencing CC adoption (CCA) services in Indian private organizations. The paper came up with new determinants, namely, risk analysis and perceived IT security risk as defined by the extended TOE framework. The results revealed that

trust, management style, technology innovation, risk analysis, and perceived IT security risk had a significant influence on CCA. The SEM results were perceived as inputs for the ANN approach and ISM methodology. The results of ANN highlighted that perceived IT security risk, trust, and management style were the most vital determinants for CC adoption services among Indian organizations. The study in [10] examined the adoption of CC by the private sector in Oman. The paper deployed TOE and found that variables in TOE are critical for the adoption of CC. A similar paper was conducted in India [58].

3.5 Unified Theory of Acceptance and Use of Technology (UTAUT)

Another single model that has gained popularity is the UTAUT. The authors in [59] used UTAUT2 to understand the factors determining the behavioral intention to use e-government services in Indonesia. Three variables have been shown to form a significant and positive relationship with BI to use e-government services: public value, habit, and effort expectancy. The performance expectancy, social influence, facilitating conditions, and trust variables do not carry any significant relationship with BI. The authors in [43] used the UTAUT2 model. Under the aspect of social influence, there was a significant difference between users and nonusers. For users, social influence was not a determinant of positive intention to use PCSS, but on the other hand, for nonusers, it was a determinant. For other factors, there were no significant differences between the two groups, but each showed some substantial similarities: Habit was the strongest predictor of the intention to use for both users and nonusers, whereas hedonic motivation did not stand to be an important concern for either; performance expectancy was a determinant for a positive intention to use PCSS for both groups. Effort expectancy was a determinant of positive intention to use PCSS for users, while it was not a determinant for nonusers.

The study in [60] extended UTAUT to examine the effect of transparency on the adoption of e-government in Indonesia from the perspective of the citizens. The results show that performance expectancy, effort expectancy, social influence, facilitating conditions, and transparency are the critical factors in the evaluation of the citizens' adoption of e-government in Indonesia. Transparency is also the strongest factor that influences Indonesian citizens' decisions to adopt e-government. The study in [35] examined the adoption of cloud-based accounting information using UTAUT in Jordan. The findings showed that variables in UTAUT were important for the adoption. The author of [8] stated that Malaysia adopted UTAUT and that six technological and human factors were examined for the Malaysian public sector. The paper discovered that performance expectancy, compatibility, security, mobility, information technology (IT) knowledge, and social influence all had a significant impact on the user's intention to accept CC. The results of this paper can help gain a clear understanding of the factors that affect the Malaysian public sector regarding CC. The TOE was used in the paper of [61], in which the variables of the TOE were used to examine the CC adoption in higher education. The paper highlights the role of trust and perceived risk.

3.6 Technology Acceptance Model (TAM)

TAM was also used in previous studies. The study in [62] adopted it to develop a theoretical research model for CC adoption in Malaysian universities. The results indicate that cloud-based e-learning adoption is influenced by need and perceived usefulness, although innovativeness does not appear to be significant in the intention to adopt cloud-based e-learning. Also, [63] used TAM3 to examine the factors determining CC adoption. The results show that employee experience has no moderating effect on the relationship between subjective norms and PU. Experience moderates the effect of PEOU on PU. In other words, the higher the experience, the greater the effect of PEOU on PU. Additionally, PEOU, with respect to the perceived enjoyment

and playfulness variables, carries a mediating effect. PU and PEOU in CC exert a positive effect on BI. A study by [64] deployed TAM to examine the adoption of CC in Pakistan. The findings showed that variables of TAM such as PEOU and PU are critical for the adoption.

3.7 Multi-Criteria Decision Making

Another method, such as the Analytic Hierarchy Process (AHP), was used by researchers. In the study of [65], the AHP and semi-structured interviews were used. The result showed that top management support, relative advantage, privacy, and external support are the most important aspects of cloud-based human resource information systems (HRIS) for the micro, small, and medium enterprises (MSMEs) in Jabodetabek, Indonesia. Similarly, [14] named 12 factors that can be categorized using the TOE framework; they are divided into technological, organizational, and environmental criteria. Using a semi-structured interview method, those factors were reviewed by experts in the CC industry in Indonesia. The factors are then analyzed and ranked using the AHP method to obtain critical success factors (CSF). The result highlights that critical factors in the organization, technology, and environmental criteria are top management support, security, and government regulation, respectively.

3.8 Several Theoretical Frameworks

The second group of studies settled on more than one theory as it examined the adoption of new technologies in developed and developing countries in different fields. The study in [66] proposed a theoretical model with reference to the literature on technology adoption models. It constructs scale measurements by extracting and adapting the items from the literature. The authors verify the scales' content validity and reliability by using face validity, pre-testing, and a pilot test. For the pilot testing, the authors compiled the data from 26 information technology staff in five public organizations in Yemen. The authors test the reliability of the scales using Cronbach's alpha criterion and then conduct an exploratory factor analysis to evaluate the scales' validity. In addition, an instrument is developed to empirically investigate the influencing factors of CC adoption in the context of e-government initiatives in developing countries. The results show that the scale measurements did meet the conventional criteria of both reliability and validity.

The author of [21] examined the importance and performance of the factors that influence the fitness of CC before the e-government. To address this issue, the paper integrates the task-technology fit model (TTF) and the diffusion of innovation theory (DOI). Yemeni public institutions were the sources for data collection, and 292 information technology employees became the sample respondents for a structured questionnaire. The results show that security, compatibility, relative advantage, and tasks were the variables that affected the fitness of CC for e-government activities. The authors of [67] paid attention to the organizational factors that affect the organization's decision to adopt CC. Data were collected by using a questionnaire for 90 respondents in the research designed for SMEs in Malaysia. Results indicate that only information technology (IT) resources were found to be significant out of the three factors hypothesized to affect CC adoption. Nevertheless, the evidence to support the importance of top management support and employee involvement appeared to be insufficient. The authors of [68] conducted an exploratory paper on utilizing CC in public-sector cases all around the world. The paper suggested that relative advantage, CC vendor image, and user trust are very important for CC adoption. The study in [9] examined the three sectors involved in implementing CC: the healthcare industry, higher education institutions, and the public sector. Five major factors involved—technology readiness, human readiness, organization support, environment, security, and privacy—have well-represented the three sectors.

Financial factors and cost savings have recently joined the list of factors in the healthcare sector. It has been established that the most important contributing factors to the use of CC are technology readiness, human readiness, organization support, environment, security, and privacy. A study by [69] listed the influential factors in the adoption of CC based on extant literature and expert opinions. Existing TOE and DOI and new influential factors that were never explored in the past were used together to develop the model. The data analysis states that students support CC adoption in the institutions, and it is observed that external pressure is the most important factor in CC adoption, followed by confidentiality and loss of governance.

In a study by [70] in Saudi Arabia, the influencing factors behind the decision to adopt CC in the private sector were investigated. An integrated model is proposed that incorporates some critical factors derived from a literature review along with other factors (such as physical location) that have yet to be examined in previous studies as the main factors in the organization's decision to adopt cloud services. It has been shown that the quality of service, security, privacy, and trust have a direct impact on an organization's intention, whereas security and privacy concerns still serve as a limitation for cloud adoption. To add, six factors—namely, relative advantage, compatibility, trialability, top management support, external support, and culture—were found to have a negative, indirect impact on cloud adoption. Next, this paper confirmed that the physical location also has a direct impact on compliance with regulations and on privacy. The study in [1] looked into the factors that could have a possible effect on CC adoption by the Iraqi e-government using TOE and TAM, and they found that these factors were very important for CC e-government adoption.

The study in [71] explored the issues that impact the cloud-based enterprise resource planning (ERP) reception in Iraqi SMEs through the use of both TOE and DOI. The paper discovered that compatibility, relative advantage, complexity, availability, security, reliability, trust, privacy, top management support, internet speed and accessibility, organizational readiness, competitive pressure, vendor support, and physical location are significant factors. The authors of [72] deployed the TOE, UTAUT, and DOI models to look into the adoption of B2G e-government in Iraq. There are a number of significant relationships shown, and they include relative advantages, compatibility, security, management support, and IT infrastructure by moderating language on e-government adoption, to name but a few. Also using TOE, SET, and DOI [73], we studied the influencing factors for the adoption of the electronic health record (EHR) among Iraqi healthcare providers. It was found that knowledge and skills, training, attitudes towards privacy and security, cost-effectiveness, compatibility, complexity, top management support, organization size, IT capabilities, culture, policy, and government support have significant relationships with EHR adoption in Iraqi healthcare organizations.

In the study of [74], which concentrated on SMEs in developing economies, he examined the main determinants of logistical factors that have an impact on the adoption of cloud ERP by adopting the DOI and TOE models as the theoretical framework. The findings show that compatibility, technology readiness, technical barriers, top management support, enterprise readiness, enterprise size, and competitive pressure have a significant effect on cloud ERP adoption. The author of [20] highlights the relevant factors that influence the acceptance of CC implementation in the organization. 55 articles related to CC implementation were reviewed, and a total of 21 factors were obtained. The articles were arranged according to their frequency based on the thematic analysis method. These factors are: compatibility, top management support, relative advantage, security, complexity, external pressure, IT knowledge, cost, trust, trialability, regulations and government support, innovativeness, external expertise, sharing and

collaboration, user experiences, awareness, firm size, social influence, task, vendor support, and business continuity.

In the study of [19], the authors studied the factors impacting the adoption of CBEG by decision-makers. The findings suggested that the most important construct is technology, and the next most important is organization. Relative advantages, compatibility, complexity, and reliability are named as the important technological factors for CBEG adoption. Top management support is the most important organizational factor, and the next two are technological competence and cost. The amount of IT knowledge possessed by the decision-makers serves as the major indicator of CBEG adoption. It would be good for the decision-makers to use the proposed framework to reduce the time, cost, and effort of developing the CBEG system, as well as increase the usage of electronic services among the citizens.

A study by [75] deploys the TOE framework and contextual theory to examine empirically the CC service adoption determinants in Lebanon. Results indicate that technological (i.e., complexity and security) and organizational (i.e., top management support and prior IT experience) factors have a positive link with the decision to adopt CC services. The study in [76] made a summary of the literature on electronic government frameworks and models for the identification of multiple constructs and their relationships to evaluate the performance of e-government projects. 136 constructs were mapped across five categories. Across the literature, the dominant constructs used were PEOU, PU, user satisfaction, infrastructure, website maturity, security, user trust, transparency, empowerment, operational efficiency, service quality, and information quality. A study by [77], whose paper is based in Australia, studied the role played by government regulations in CC adoption. The statistically significant factors were cost, quality of services, security, privacy, management, government-based facilitation conditions, and firm-based facilitation conditions regulations. Conclusively, the paper found that government regulation is a significant aspect in decision-making for the adoption of any new technology, and this includes CC.

The authors in [18] introduced a model of CC adoption for the National Project for Vehicle Registration and Driving License as an agency within the Iraqi e-government where it presents online e-services for citizens. Factors like complexity, internet connection, privacy, regulation, security, and trust were shown to have a negative influence over the adoption decision of CC, while compatibility, ease of use, human readiness, relative advantage, technology readiness, top management support, and usefulness exerted a positive influence over the adoption decision of CC. A study by [78] shed light on the factors influencing the intention to adopt CC-SaaS in Iraqi organizations. It was revealed that compatibility, security, privacy, top management support organization readiness, and IT knowledge have the smallest or almost zero standard deviations. This suggests that they are the most important or most significant factors that influence the CC-SaaS, as their values are close to the mean of the statistical data set.

The author of [42] further looked into the factors behind the adoption of CC and how they are advantageous to companies. A paper framework containing four hypotheses has been developed based on the results established from previous studies. The results suggested that CC adoption is affected by four variables: the human factor (with sub-indicators of personal innovativeness and knowledge), the organizational factor (with sub-indicators of size, adequacy of resources, and top management support), the technical factor (with sub-indicators of compatibility and security), and the environmental factor (with the sub-indicator of regulatory environment and competitive pressure).

The authors of [79] also recognized the factors that may influence cloud adoption in the industry. TOE and DOI were used in the paper, and there were mentions of the benefits of cloud technology in the upstream oil and gas sector, challenges that hinder the adoption, and also the approaches by earlier researchers to support cloud migration in the industry. Moreover, there is also a proposal for a model consisting of factors that can potentially affect adoption in the industry. The factors include the technological characteristics of CC, the industry organization, and environmental constraints, not to mention both the social and political influences.

The focus on the role of IT capabilities in the success of e-government systems was given by [80]. He proposed a model based on the integration of the updated DeLone and McLean model (D&M) with the UTAUT model, with variables namely IT capabilities, information quality, system quality, performance expectancy, effort expectancy, perceived support quality, and e-government system usage. It was found that IT capabilities and the factors included in the updated D&M and UTAUT models served as important forecasts that warranted the success of e-government systems. The authors of [81] worked on a conceptual framework that connects the predictors and the consequences of adopting CC for SMEs in Saudi Arabia. Based on the resource-based view (RBV) and TOE, this paper proposes that adoption will be determined by organizational, technological, and environmental factors and that this will gradually have a consequence for the organizational performance of SMEs.

The authors in [82] focused on the determinants of CC adoption in SMEs and measured the effect of CC adoption on cloud-supported firm performance by means of enhancing organizational agility. The paper model is developed by incorporating two popular theoretical models, the UTAUT and TOE frameworks. It was shown in the paper that the significant predictors of CC adoption are performance expectancy, effort expectancy, absorptive capacity, data security and privacy, and perceived trust. To add, CC adoption positively influences firm performance in a direct way, and this is through organizational agility. The results of the importance-performance map analysis indicate that effort expectancy falls in the critical zone, and this necessitates further improvement. The authors in [17] studied the determinants of CC-SaaS adoption in Iraqi public organizations as viewed by IT professionals. TOE, DOI, and HOT have become the basis for the paper model, and the expert's opinion forms the basis for the variables. The results pinpointed that the effects of technology, organization, environment, and human variables were statistically significant. Additionally, external support and compliance with regulations were not supported.

The study by [30] established an analysis of geographically and disciplinary scattered academic publications of CC research in information systems. A systematic literature review is conducted for a better understanding of the phenomenon. Using quality assessment criteria, the relevant research studies are cited from various online databases. The findings of this 12-year systematic review help providers and potential adopters lay out context-specific strategies for the penetration of cloud services and sound adoption decisions (ADs), respectively. The findings also agreed on the fact that there are some prospective avenues of research. Aided by the in-depth analysis, conceptual frameworks have been proposed to assist in the exploration of CC's pre-adoption and post-adoption [83], which examined the private sector of seven countries to examine the organizational transformation of CC. The paper deployed TOE, DOI, Hot-Fit, and TOE. The findings showed that the combination of these theories managed to explain the organizational transformation of CC. A study by [39] examined the adoption of CC by the banking sector in Germany. The author deployed TAM, TOE, and NFC. The findings were beneficial for identifying the factors that lead to CC adoption by banks in Germany. Table 1 shows a brief summary of the studies reviewed.

Table 1: Summary of the reviewed papers

Author/ year	Country/ Industry	Dependent variables	Mediator / moderator	Method	Data analysis	Adoption Theory
[53]	Private sector in China	CC adoption	Nil	Quantitative	AMOS	TOE
[57]	Private sector in India	CC adoption Business Performance	Nil	Mixed	SEM, ANN, ISM	TOE
[59]	Public sector in Indonesia	BI to use e-government	Nil	Quantitative	PLS	UTAUT 2
[44]	E-commerce, Australia	CC adoption	Nil	Mixed	MCDM	TOE
[65]	Private sector In Indonesia	CC human resource information system (HRIS)	Nil	Mixed	AHP	TOE
[14]	Private sector in Indonesia	Hybrid CC adoption	Nil	Qualitative	AHP	TOE
[43]	Public sector in South Korea	Adoption of CC	Nil	Quantitative	PLS	UTAUT2
[55]	Private sector of Bangladesh	CC adoption	Nil	Quantitative	PLS & ANN	TOE
[56]	In the semiconductor industry	CC adoption	Nil	Quantitative	MCDM	TOE
[60]	Public sector in Indonesia	Adoption of e-government	Nil	Quantitative	SPSS & AMOS	UTAUT
[62]	E-learning in Malaysia	CC -based e-learning	Innovativeness	Quantitative	SEM	TAM
[63]	Public sector in Turkey	CC adoption	SN, Experience, PU & PEOU	Quantitative	SEM	TAM3
[8]	Public sector in Malaysia	CC adoption	NIL	Quantitative	PLS-SEM	UTAUT
[66]	Yemen, public sector	CBEG	NIL	Quantitative	SPSS	Theoretical model
[21]	Public sector in Yemen	CBEG	NIL	Quantitative	SPSS	TTF & DOI
[67]	Private sector in Malaysia	CC adoption	NIL	Quantitative	PLS	Proposed model
[69]	Higher Education, Pakistan	CC adoption	NIL	Quantitative	PLS	TOE, DOI
[70]	Private sector in Saudi Arabia	CC adoption	Organization size	Mixed	AMOS	Proposed model
[1]	Public sector, Iraq	CBEG	NIL	Quantitative	SPSS	TOE, TAM
[72]	Business sector in Iraq	Adoption of e-government	Language Uncertainty	Quantitative	PLS	UTAUT, TOE, DOI
[73]	Health Sector, Iraq		NIL	Quantitative	SEM	TOE, DOI, SET

[74]	SMEs in developing economies.	CC Adoption	NIL	Quantitative	SPSS	TOE, DOI
[19]	Public sector in Libya	Cloud based e-government	IT knowledge	Quantitative	SPSS	TOE, DOI
[75]	SMEs in Lebanon	CC adoption	NIL	Quantitative	SPSS	TOE, DOI
[77]	Public sector In Australia	CC	NIL	Mixed	AMOS	Proposed framework
[18]	Public sector, Iraq	CC adoption	NIL	Mixed	PLS-SEM	Proposed model
[78]	Public sector, Iraq	CC adoption	Trust, IT Experience	Qualitative	SPSS	TOE DOI HOT-fit
[42]	Privet sector, Iran	CC adoption	NIL	Quantitative	PLS-SEM	Proposed model
[80]	Public sector in Iraq	IT capabilities in e-government	NIL	Quantitative	SPSS	UTAUT and DeLone McLean (D&M)
[81]	SMEs in Saudi Arabia	CC adoption	NIL	Mixed	PLS	TOE, RBV
[82]	SMEs in Bangladesh	CC adoption	Firm Size Industry Firm age	Quantitative	PLS	TOE, UTAUT
[17]	Public sector in Iraq	CC adoption	NIL	Quantitative	PLS	TOE, DOI, HOT-fit
[10]	Private sector Oman	CC adoption	Nil	Quantitative	AMOS	TOE
[23]	Federal government of USA	Migration to the cloud	Nil	Quantitative	Fixed-Effects by Driscoll and Kraay	RAT
[83]	Private sector of 7 countries in Europe, Asia, and USA	Organizational transformation due to CC	Nil	Quantitative	MLE	TOE & TAM
[61]	Higher educational USA	CC	Trust and perceived risk	Quantitative	IBM SPSS	13 factors
[35]	Private sector in Jordan	Cloud-based accounting information systems (AIS)	Nil	Quantitative	SEM	UTAUT
[58]	Private sector in India	CC Adoption	Nil	Quantitative	SEM	TOE
[47]	Public sector in South Africa	CC	Nil	Qualitative	Semi-structured interviews	Life Cycle Model (DCC)
[64]	Higher education In Pakistan	CC	Nil	Quantitative	Smart PLS	TAM
[39]	Banking sectors in Germany	CC	Nil	Quantitative	AMOS	TAM, TOE, and NFC

4. Findings

A spreadsheet is used to derive the findings of this paper. The descriptive information of the reviewed articles is provided below.

4.1 Year of the Paper

Figure 2 shows that the number of studies has dramatically risen during the period between 2016 and 2020. In the year 2021, the number had dropped. This could be due to the fact that the COVID-19 outbreak had affected data access and that attention had deliberately moved on to issues surrounding the pandemic [84]. The number of articles has increased in 2022.

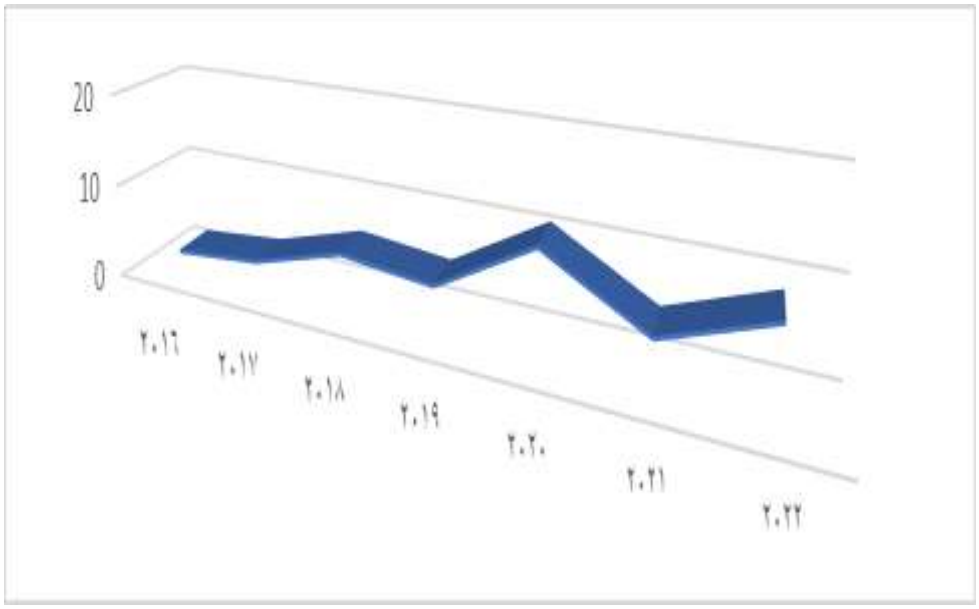

Figure 2: Year of the paper

4.2 Scope of the Papers

The scope of the paper can be divided by sector and topic. Based on the sector, the number of studies in the public sector is on the rise, and the number has even surpassed the number of studies in the private sector, as shown in Figure 3.

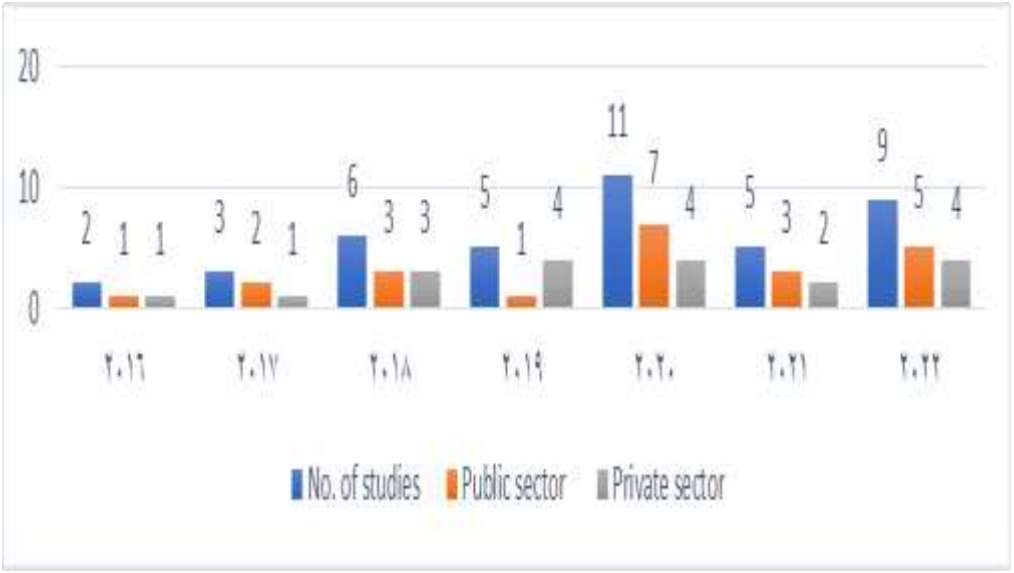

Figure 3: Papers based on sector

With regard to the topic, the reviewed studies were primarily about CC adoption and e-government, while studies of CBEG were scarce, as shown in Figure 4.

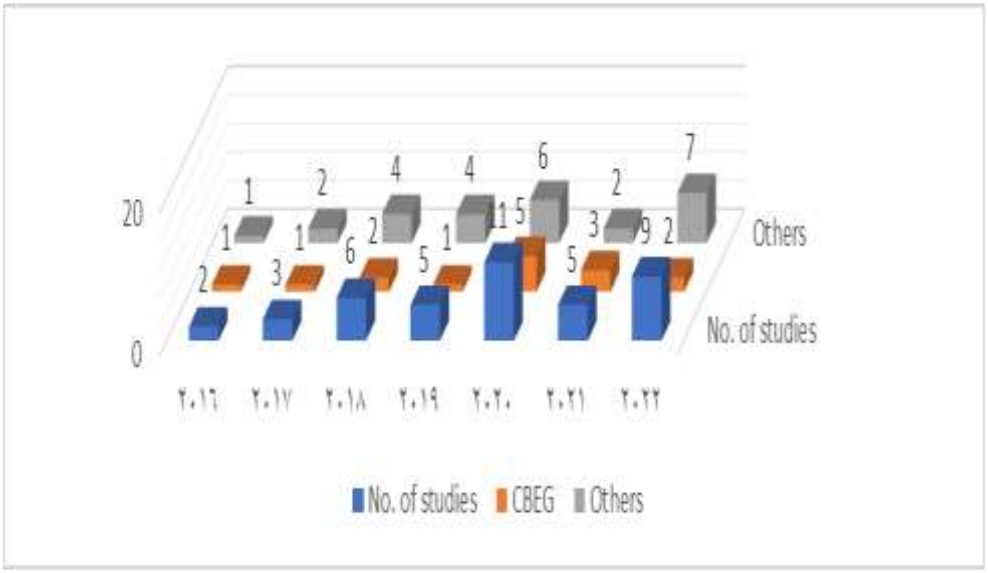

Figure 4: Papers based on topic

4.3 Methods of Reviewed Studies

There are mainly three methods adopted in the studies reviewed. These include quantitative, qualitative, and mixed methods. Figure 5 shows the distribution of studies according to the methods. It can be seen that the quantitative method has outperformed other methods, such as the qualitative and mixed methods.

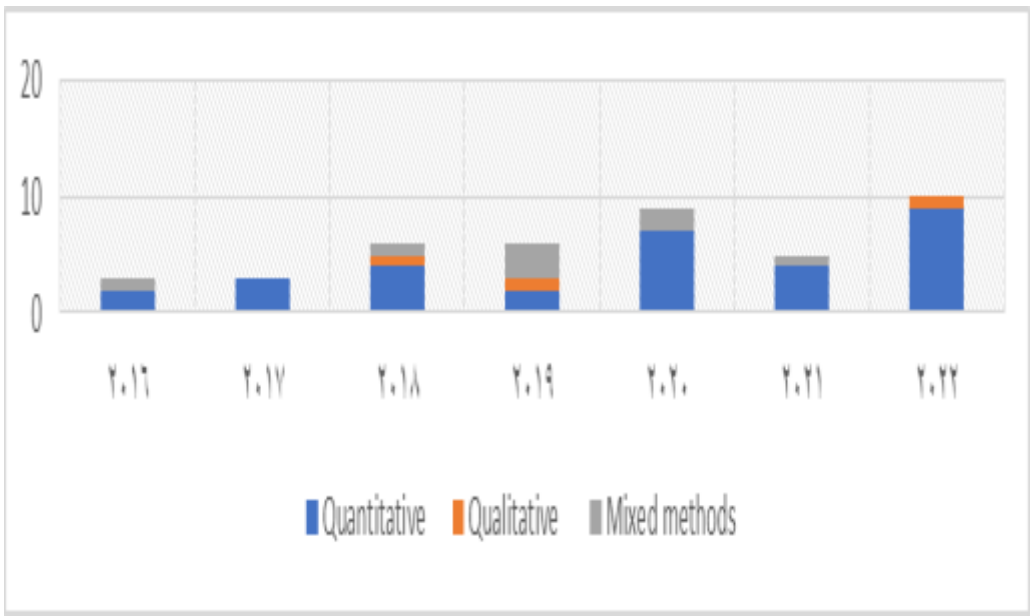

Figure 5: Methods of the Papers

4.4 Adoption theory

For the studies that have used mixed or quantitative methods, based on their frequency, the adoption theories are TOE with 44% and DOI with 19%. TAM and UTAUT were deployed in fewer studies. For justification, the two models are individual-based, while TOE and DOI are designed to foresee the organizational adoption of technology. Figure 6 shows the theory distribution.

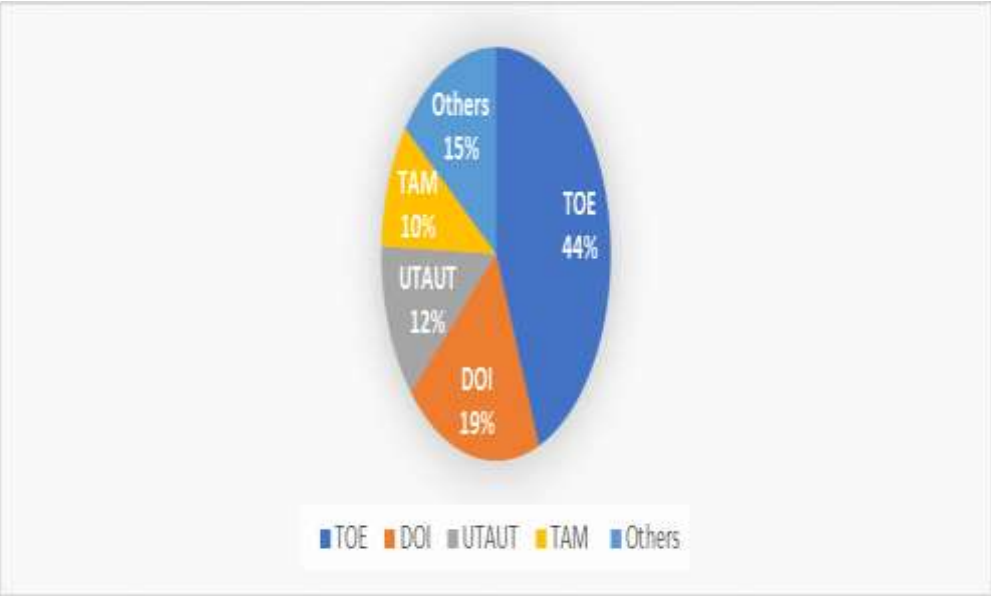

Figure 6: Theoretical adoption theory.

Based on the examination done in prior literature on the most frequent factors, it is obvious that top management support, security, compatibility, relative advantage, complexity, and privacy were the most named factors. Some other factors were moderately mentioned, such as competitive pressure, government regulation, trust, performance expectancy, effort expectancy, social influence, and organizational readiness. TAM variables were among the few frequent factors in the CBEG adoption literature.

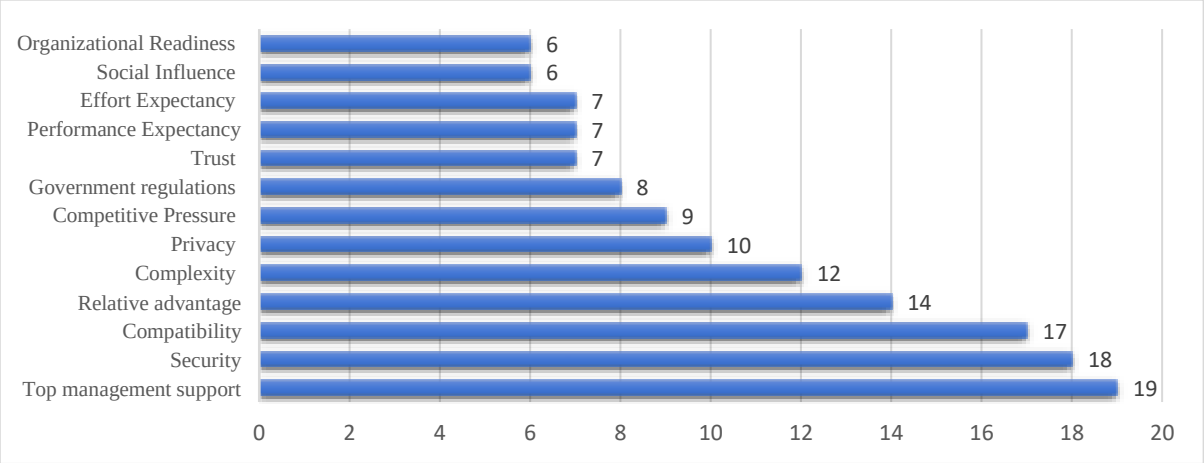

Figure 7: Frequency of Factors

The categorization of the factors is based on their theories and functions, namely technological, organizational, environmental, and individual. Table 2 highlights the distribution of factors and their categories.

Table 2: Factor, Frequency, Theory, and Category

Factor	Frequency	Theory	Category
Top management support	19	TOE	Organizational
Security	18	-	Technological
Compatibility	17	DOI	Technological
Relative advantage	14	DOI	Technological
Complexity	12	DOI	Technological
Privacy	10	-	Technological
Competitive Pressure	9	TOE	Environmental
Government regulations	8	TOE	Environmental
Trust	7	SET	Technological
Performance Expectancy	7	UTAUT	Individual
Effort Expectancy	7	UTAUT	Individual
Social Influence	6	UTAUT	Individual
Organizational Readiness	6	-	Organizational

4.5 Data Analysis

The data analysis technique adopted in earlier literature is smart partial least square (Smart PLS); 45% of the reviewed studies have used this technique. This is followed by SPSS at 24%, AMOS at 17%, and MCDM at 14%. Smart PLS is popular as it is able to examine complex models. Figure 8 shows the data analysis techniques that have been adopted in previous studies.

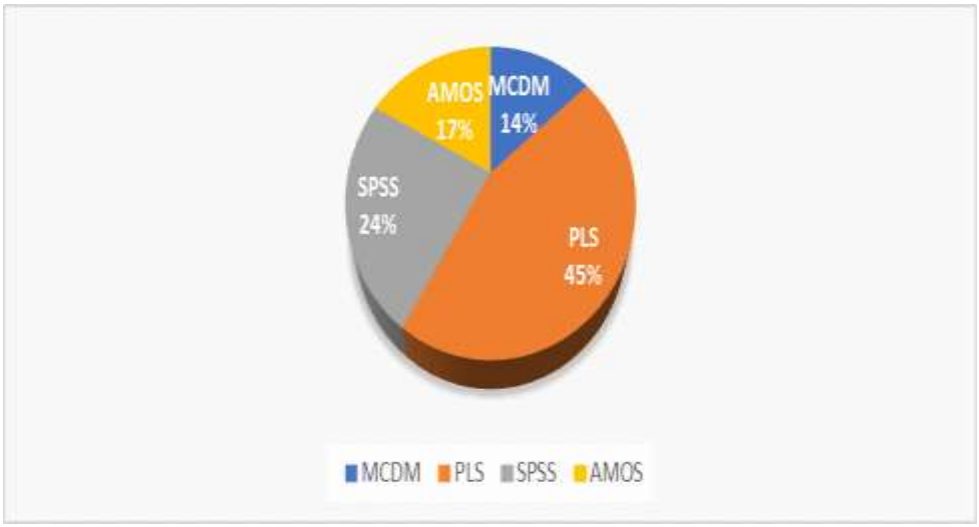

Figure 8: Data analysis technique

5. Results Discussion

This paper was conducted with the interest of probing into the literature on CBEG adoption. The findings based on the descriptive analysis highlighted that the number of studies is slowly increasing in the CBEG, e-government, and CC. However, a drastic drop was observed in 2021, possibly explained by the outbreak of COVID-19 or the time period of the paper. An increase in the number of articles has been observed in 2022. The findings suggest that the number of articles in the public sector is increasing, and this may imply government policy to use the technology and reduce expenditure. Even so, CBEG studies are still scarce. These findings are consistent with other previous studies that urge for CBEG and the need to address the limited papers on this topic [7]. Method-wise, the quantitative method is found to have dominated the literature, although the qualitative [47] and mixed methods are also conducted.

Since CBEG adoption takes an organizational approach, the theory of TOE and DOI has become abundant in this field. The individual theories, such as TAM and UTAUT, were scant. This finding contradicts the findings of a prior literature review paper that showed the prevalence of TAM theory in the context of e-government [2]. As DOI and TOE were mostly used, the most frequent factors were found to be top management support, security, compatibility, and relative advantage, as well as complexity. This finding agreed with the finding of a prior paper, which noted the increasing importance of factors such as security, relative advantage, and compatibility [53, 54]. The advancement in this topic is observed through many advanced techniques, such as Smart PLS, part of the structural equation model. This finding is consistent with prior papers such as [64], [17], and [82].

6. Conclusion, Limitations, and Future work

This paper conducted a systematic literature review of papers related to the adoption of CBEG. The number of articles has been found to be increasing in CBEG, and in particular in the public sector. The paper also noted that quantitative studies have outperformed other methods. TOE and DOI have been deployed as theoretical frameworks. This has resulted in the high frequency of variables such as top management support, security, computability, relative advantage, and complexity. A majority of studies have used SEM.

This paper is limited when it comes to the number of articles used as references. Based on this limitation, future studies should recommend expanding the inclusion criteria so that more articles can be included. More empirical studies of CBEG are needed. Conducting mixed-method or qualitative studies can help to better understand the predictors of CBEG. As a potential respondent, decision-makers in public organizations can serve as the target respondents for qualitative or quantitative studies. Further, future studies are recommended to combine theories such as TOE with TAM or UATUT or SET to better explain the adoption of CBEG. The use of mediator or moderator is still scarce in the body of literature, so future papers may need to include mediating and moderating variables such as innovativeness, trust, or demographic variables such as education and experience with IT. The important factors (top management support, security, compatibility, relative advantage, complexity, and privacy, as well as other factors) can be exploited by decision-makers to augment their understanding of the predictors behind successful CBEG. Additionally, these factors can also be examined next so that their importance can be verified.

References

[1] B. S. Shukur, M. K. A. Ghani, and M. A. Burhanuddin, "An analysis of cloud computing adoption framework for Iraqi e-government," *Int. J. Adv. Comput. Sci. Appl.*, vol. 9, no. 8, pp. 104–112, 2018.

[2] M. B. S. Bojang, "Challenges and Successes of E-Government Development in Developing Countries : A Theoretical Review of the Literature," *Int. J. Res. Innov. Soc. Sci.*, vol. 3, no. 4, pp. 410–414, 2020.

[3] R. F. Albadri, "The Readiness of E-Government Adoption in Iraq: A Case Study of Al-Muthanna Province," *Int. J. Psychosoc. Rehabil.*, vol. 24, no. 4, pp. 5750–5762, 2020.

[4] R. H. Salman, N. A. Shiltagh, and M. Z. Abdullah, "Development of a Job Applicants E-government System Based on Web Mining Classification Methods," *Iraqi Journal of Science*, vol. 64. no. 3. pp. 2748–2758, 2021.

[5] M. A. Haque *et al.*, "Sustainable and efficient E-learning internet of things system through blockchain technology," *E-Learning Digit. Media*, vol. 0, no. 0, pp. 1–20, 2023.

[6] J. Alonso, M. Escalante, and L. Orue-Echevarria, "Transformational Cloud Government (TCG): Transforming Public Administrations with a Cloud of Public Services," *Procedia Comput. Sci.*, vol. 97, no. 1, pp. 43–52, 2016.

[7] O. Abied, O. Ibrahim, and S. N. M. Kamal, "Adoption of Cloud Computing in E-Government : A Systematic Literature Review," vol. 30, no. 1, pp. 655–689, 2022.

[8] M. T. Amron, R. Ibrahim, and N. A. A. Bakar, "Cloud computing acceptance among public sector employees," *Telkomnika (Telecommunication Comput. Electron. Control.*, vol. 19, no. 1, pp. 124–133, 2021.

[9] M. T. Amron, R. Ibrahim, and S. Chuprat, "A Review on Cloud Computing Acceptance Factors," *Procedia Comput. Sci.*, vol. 124, no. 3, pp. 639–646, 2017.

[10] O. I. Tawfik and O. Durrah, "Factors influencing the implementation of cloud accounting : evidence from small and medium enterprises in Oman," *J. Sci. Technol. Policy Manag.*, vol. Ahead of p, no. Ahead of printing, p. Ahead of printing, 2022.

[11] Y. Chang, S. F. Wong, U. Eze, and H. Lee, "The effect of IT ambidexterity and cloud computing absorptive capacity on competitive advantage," *Ind. Manag. Data Syst.*, vol. 119, no. 3, pp. 613–638, 2019.

[12] Y. Li, L. Zhu, and W. Tu, "Research on e-government data management in cloud computing environment," *Proc. - 2019 Int. Conf. Smart Grid Electr. Autom. ICSGEA 2019*, pp. 289–292, 2019.

[13] Y. Liang, G. Qi, X. Zhang, and G. Li, "The effects of e-Government cloud assimilation on public value creation: An empirical study of China," *Gov. Inf. Q.*, vol. 36, no. 4, p. 101397, 2019.

[14] A. Suhanto, A. N. Hidayanto, M. Naisuty, W. A. Bowo, N. F. Ayuning Budi, and K. Phusavat, "Hybrid Cloud Data Integration Critical Success Factors: A Case Study at PT Pos Indonesia," *Proc. 2019 4th Int. Conf. Informatics Comput. ICIC 2019*, 2019.

[15] F. Mohammed, F. Olayah, A. Ali, and N. A. Gazem, "The effect of cloud computing adoption on the sustainability of e-government services: A review," *Int. J. Adv. Sci. Technol.*, vol. 29, no. 5, pp. 2636–2642, 2020.

[16] T. Abd, Y. S. Mezaal, M. S. Shareef, S. K. Khaleel, H. H. Madhi, and S. F. Abdulkareem, "Iraqi e-government and cloud computing development based on unified citizen identification," *Period. Eng. Nat. Sci.*, vol. 7, no. 4, pp. 1776–1793, 2019.

[17] H. J. Hadi, M. A. Omar, and W. R. S. Osman, "Investigating the determinants of CC-SaaS adoption in Iraqi's public organizations from the perspective of IT professionals," *Int. J. Eng. Res. Technol.*, vol. 14, no. 2, pp. 130–143, 2021.

[18] M. Khanapi, A. Ghani, and S. Shukur, "Modelling the Utilization of Cloud Computing Adoption via the National Project for Vehicles Registration and Driving License in Iraq," *Int. J. Adv. Sci. Technol.*, vol. 29, no. 10S, pp. 3621–3635, 2020.

[19] M. Mousa, "Determinants of Cloud Based E-government in Libya," *J. Crit. Rev.*, vol. 7, no. 8, pp. 13–22, 2020.
[20] M. T. Amron, R. Ibrahim, N. A. Abu Bakar, and S. Chuprat, "Determining factors influencing the acceptance of cloud computing implementation," *Procedia Comput. Sci.*, vol. 161, pp. 1055–1063, 2019.
[21] F. Mohammed, A. I. Alzahrani, O. Alfarraj, and O. Ibrahim, "Cloud Computing Fitness for E-Government Implementation: Importance-Performance Analysis," *IEEE Access*, vol. 6, no. 3, pp. 1236–1248, 2017.
[22] H. Salah Hashim and Z. Amin Al-Sul, "Cloud computing based e-government in Iraq using partial least square algorithm," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 22, no. 2, p. 953, 2021.
[23] M. S. Pang and H. Tanriverdi, "Strategic roles of IT modernization and cloud migration in reducing cybersecurity risks of organizations: The case of U.S. federal government," *J. Strateg. Inf. Syst.*, vol. 31, no. 1, pp. 101-107, 2022.
[24] C. Okoli, "A guide to conducting a standalone systematic literature review," *Commun. Assoc. Inf. Syst.*, vol. 37, no. 1, pp. 879–910, 2015.
[25] N. A. Jasim, E. M. Hameed, and S. A. Jasim, "Challenges in E-governments: A case study-based on Iraq," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 1076, no. 1, p. 12-38, 2021.
[26] F. Mohammed, O. Ibrahim, M. Nilashi, and E. Alzurqa, "Cloud computing adoption model for e-government implementation," *Inf. Dev.*, vol. 33, no. 3, pp. 303–323, 2017.
[27] H. Sallehudin *et al.*, "Performance and Key Factors of Cloud Computing Implementation in the Public Sector," *Int. J. Bus. Soc.*, vol. 21, no. 1, pp. 134–152, 2020.
[28] A. M. Samsor, "Challenges and Prospects of e-Government implementation in Afghanistan," *Int. Trade, Polit. Dev.*, vol. 5, no. 1, pp. 51–70, 2021.
[29] Gartner, "Cloud Computing Survey," 2017.
[30] M. Sharma, R. Gupta, and P. Acharya, "Analysing the adoption of cloud computing service: a systematic literature review," *Glob. Knowledge, Mem. Commun.*, vol. 70, no. 1/2, pp. 114–153, 2020.
[31] F. Asmi, R. Zhou, and L. Lu, "E-government Adoption in Developing Countries: Need of Customer-centric Approach: A Case of Pakistan," *Int. Bus. Res.*, vol. 10, no. 1, pp. 42, 2017.
[32] N. Al Mudawi, N. Beloff, and M. White, "Issues and challenges: Cloud computing e-government in developing countries," *Int. J. Adv. Comput. Sci. Appl.*, vol. 11, no. 4, pp. 7–11, 2020.
[33] A. Alkhwaldi, M. Kamala, and R. Qahwaji, "Security Perceptions in Cloud-based e-Government Services: Integration between Citizens' and IT-staff Perspectives," *Proc. 2019 IEEE 12th Int. Conf. Glob. Secur. Saf. Sustain.*, pp. 158-+, 2019.
[34] C. Vijai and D. Joyce, "Cloud-Based E-Governance in India," *Shanlax Int. J. Manag.*, vol. 8, no. 2, pp. 72–78, 2020.
[35] M. Al-okaily, "Cloud-based accounting information systems usage and its impact on Jordanian SMEs ' performance : the post- COVID-19 perspective," *J. Financ. Report. Account.*, p. ahead of printing, 2022.
[36] A. Wahhab, A. S. Aljeboori, M. Talib, and A. Alshammari, "The influence of cloud accounting applications on the accounting and auditing profession in Iraq," *PalArch's J. Archaeol. Egypt/Egyptology*, vol. 17, no. 3, pp. 2185–2201, 2020.
[37] I. Senarathna, C. Wilkin, M. Warren, W. Yeoh, and S. Salzman, "Factors that influence adoption of cloud computing: An empirical study of Australian SMEs," *Australasian Journal of Information Systems*, vol. 22, no. 1, pp. 1–23, 2018. https://doi.org/10.3127/ajis.v22i0.1603.
[38] K. E. Ali, S. A. Mazen, and E. E. Hassanein, "A proposed hybrid model for adopting cloud computing in e-government," *Futur. Comput. Informatics J.*, vol. 3, no. 2, pp. 286–295, 2018.
[39] H. Stewart, "The hindrance of cloud computing acceptance within the financial sectors in Germany," *Inf. Comput. Secur.*, vol. 30, no. 2, pp. 206–224, 2022.
[40] H. Chasib, "A Review of Significant Factors in Cloud Computing and Proposed a Model for Healthcare Sector in Iraq," *JASC J. Appl. Sci. Comput.*, vol. 5, no. 2, pp. 1–19, 2019.
[41] P. J. Sun, "Security and privacy protection in cloud computing: Discussions and challenges," *J. Netw. Comput. Appl.*, vol. 160, no. 3, pp. 102-122, 2020.
[42] C. Jianwen and K. Wakil, "A model for evaluating the vital factors affecting cloud computing adoption: Analysis of the services sector," *Kybernetes*, vol. 49, no. 10, pp. 2475–2492, 2020.

[43] C. Hoon Song, S. W. Kim, and Y. woo Sohn, "Acceptance of public cloud storage services in South Korea: A multi-group analysis," *Int. J. Inf. Manage.*, vol. 51, no. 8, p. 102-135, 2019.

[44] O. Sohaib, M. Naderpour, W. Hussain, and L. Martinez, "Cloud computing model selection for e-commerce enterprises using a new 2-tuple fuzzy linguistic decision-making method," *Comput. Ind. Eng.*, vol. 132, no. 4, pp. 47–58, 2019.

[45] Y. A. M. Qasem, R. Abdullah, Y. Y. Jusoh, R. Atan, and S. Asadi, "Cloud Computing Adoption in Higher Education Institutions: A Systematic Review," *IEEE Access*, vol. 7, no. 4, pp. 63722–63744, 2019.

[46] C. Stergiou, K. E. Psannis, B.-G. Kim, and B. Gupta, "Secure integration of IoT and cloud computing," *Futur. Gener. Comput. Syst.*, vol. 78, no. 1, pp. 964–975, 2018.

[47] A. Shibambu and N. S. Marutha, "A framework for management of digital records on the cloud in the public sector of South Africa," *Inf. Discov. Deliv.*, vol. 50, no. 2, pp. 165–175, 2022.

[48] Y. Liang, G. Qi, K. Wei, and J. Chen, "Exploring the determinant and influence mechanism of e-Government cloud adoption in government agencies in China," *Gov. Inf. Q.*, vol. 34, no. 3, pp. 481–495, 2017.

[49] A. Alkhwaldi, M. Kamala, and R. Qahwaji, "From e-government to cloud-government: Challenges of Jordanian citizens' acceptance for public services," in *2017 12th International Conference for Internet Technology and Secured Transactions (ICITST)*, vol 12, no.1, pp. 298–304, 2017

[50] H. Sallehudin, R. C. Razak, and M. Ismail, "Determinants and Impact of Cloud Computing Implementation in the Public Sector," *J. Adv. Inf. Technol.*, vol. 3, no. 11, pp. 245–251, 2016.

[51] M. Al-Ruithe, E. Benkhelifa, and K. Hameed, "Current State of Cloud Computing Adoption - An Empirical Study in Major Public Sector Organizations of Saudi Arabia (KSA)," *Procedia Comput. Sci.*, vol. 110, no. 1, pp. 378–385, 2017.

[52] A. Alkhwaldi, M. Kamala, and R. Qahwaji, "Analysis of cloud-based e-government services acceptance in Jordan : challenges and barriers Link to Item Analysis of Cloud-Based E-government Services Acceptance in Jordan : School of Electrical Engineering and Computer Science," *J. Internet Technol. Secur. Trans.*, vol. 6, no. 2, pp. 556–568, 2018.

[53] P. K. Senyo, J. Effah, and E. Addae, "Preliminary insight into cloud computing adoption in a developing country," *J. Enterp. Inf. Manag.*, vol. 29, no. 4, pp. 505–524, 2016.

[54] I. Mrhaouarh, C. Okar, A. Namir, and N. Chafiq, "Cloud Computing adoption in developing countries: A systematic literature review," *2018 IEEE Int. Conf. Technol. Manag. Oper. Decis. ICTMOD 2018*, pp. 73–79, 2018.

[55] A. Khayer, M. S. Talukder, Y. Bao, and M. N. Hossain, "Cloud computing adoption and its impact on SMEs' performance for cloud supported operations: A dual-stage analytical approach," *Technol. Soc.*, vol. 60, no. 3, pp. 101225, 2020.

[56] N. Pawar, S. C. Misra, and S. Singh, "Assessment of Success Factors for Cloud adoption in Semiconductor Industry using Hybrid DEMATEL-ANP," *Proc. - 2020 IEEE Int. Conf. Eng. Technol. Innov. ICE/ITMC 2020*, 2020.

[57] R. D. Raut, P. Priyadarshinee, B. B. Gardas, and M. K. Jha, "Analyzing the factors influencing cloud computing adoption using three stage hybrid SEM-ANN-ISM (SEANIS) approach," *Technol. Forecast. Soc. Change*, vol. 134, no. 7, pp. 98–123, 2018.

[58] J. P. Shetty and R. Panda, "Cloud adoption in Indian SMEs–an empirical analysis," *Benchmarking*, vol 3, no. 1, pp. 1-12, 2022.

[59] Syamsudin, R. Meiyanti, D. Satria, R. Wahyuni, and D. I. Sensuse, "Exploring factors influence behavioral intention to use E-government services using unified theory of acceptance and use of technology 2 (UTAUT2)," *2018 Int. Semin. Res. Inf. Technol. Intell. Syst. ISRITI 2018*, vol. 2, pp. 237–242, 2018.

[60] A. Sabani, "Investigating the influence of transparency on the adoption of e-Government in Indonesia," *J. Sci. Technol. Policy Manag.*, vol. 13, no. 3, pp. 121-133, 2020.

[61] D. Alsmadi, M. Halawani, V. Prybutok, and R. Al-Smadi, "Intention, trust and risks as core determinants of cloud computing usage behavior," *J. Syst. Inf. Technol.*, vol. 7, no. 3, pp. 178–201, 2022.

[62] L. A. Hussein and M. F. Hilmi, "Cloud Computing Based E-learning in Malaysian universities," *Int. J. Emerg. Technol. Learn.*, vol. 15, no. 8, pp. 4–21, 2020.

[63] E. Cengiz and H. Bakırtaş, "Technology Acceptance Model 3 in Understanding Employee's Cloud Computing Technology," *Glob. Bus. Rev.*, vol. 4, no. 5, pp. 133-151, 2020.
[64] S. A. Raza and K. A. Khan, "Knowledge and innovative factors: how cloud computing improves students' academic performance," *Interact. Technol. Smart Educ.*, vol. 19, no. 2, pp. 161–183, 2022.
[65] M. I. R. Imron, A. N. Hidayanto, W. R. Fitriani, W. S. Nugroho, and D. I. Inan, "Analysis of cloud-based human resource information system adoption factors prioritization in micro, small, and medium enterprises," *2019 Int. Conf. Adv. Comput. Sci. Inf. Syst. ICACSIS 2019*, vol. 5, no. 3, pp. 295–300, 2019.
[66] F. Mohammed, O. Ibrahim, and N. Ithnin, "Factors influencing cloud computing adoption for e-government implementation in developing countries: Instrument development," *J. Syst. Inf. Technol.*, vol. 18, no. 3, pp. 297–327, 2016.
[67] H. Hassan, "Organisational factors affecting cloud computing adoption in small and medium enterprises (SMEs) in service sector," *Procedia Comput. Sci.*, vol. 121, no. 3, pp. 976–981, 2017.
[68] E. Abu-Shanab and F. Estatiya, "Utilizing Cloud Computing in public sector cases from the world," *Proc. 2017 IEEE Int. Conf. Appl. Syst. Innov. Appl. Syst. Innov. Mod. Technol. ICASI 2017*, vol. 3, no. 4, pp. 1702–1705, 2017.
[69] M. I. Tariq, S. Tayyaba, H. Rasheed, and M. W. Ashraf, "Factors influencing the Cloud Computing adoption in Higher Education Institutions of Punjab, Pakistan," *Proc. 2017 Int. Conf. Commun. Comput. Digit. Syst. C-CODE 2017*, pp. 179–184, 2017.
[70] N. Alkhater, R. Walters, and G. Wills, "An empirical study of factors influencing cloud adoption among private sector organisations," *Telemat. Informatics*, vol. 35, no. 1, pp. 38–54, 2018.
[71] G. J. Mohammed and M. A. Burhanuddin, "Conceptual model for adoption cloud-based ERP in SMEs: Case study Iraq," *Int. J. Eng. Technol.*, vol. 7, no. 3, pp. 756–758, 2018.
[72] H. A. Riyadh, S. A. Alfaiza, and A. A. Sultan, "The effects of technology, organisational, behavioural factors towards utilization of egovernment adoption model by moderating cultural factors," *J. Theor. Appl. Inf. Technol.*, vol. 97, no. 8, pp. 2142–2165, 2018.
[73] N. Ali Fahem and A. G. Mohd Khanapi, "Adoption of E-Health Records Management Model in Health Sector of Iraq," *Indian J. Sci. Technol.*, vol. 11, no. 30, pp. 1–20, 2018.
[74] M. A. AL-Shboul, "Towards better understanding of determinants logistical factors in SMEs for cloud ERP adoption in developing economies," *Bus. Process Manag. J.*, vol. 25, no. 5, pp. 887–907, 2019.
[75] M. Skafi, M. Yunis, and A. Zekri, "Factors Influencing SMEs' Adoption of Cloud Computing Services in Lebanon: An Empirical Analysis Using TOE and Contextual Theory," *IEEE Access* vol. 13, no. 3, pp. 1221-1234, 2020.
[76] H. Singh, P. Grover, A. K. Kar, and P. V. Ilavarasan, *Review of performance assessment frameworks of e-government projects*, vol. 14, no. 1, pp. 104-113, 2020.
[77] O. Ali and V. Osmanaj, "The role of government regulations in the adoption of cloud computing: A case study of local government," *Comput. Law Secur. Rev.*, vol. 36, no. 3, pp. 209-221, 2020.
[78] H. J. Hadi, N. Othman, W. Rozaini, and S. Osman, "Developing a Conceptual Model for the Intention to Adopt CC-Saas," *Int. J. Eng. Adv. Technol.*, vol. 9, no. 3, pp. 109–118, 2020.
[79] M. M. Lawan, C. F. Oduoza, and K. Buckley, "Proposing a conceptual model for cloud computing adoption in upstream oil & gas sector," *Procedia Manuf.*, vol. 51, no. 1, pp. 953–959, 2020.
[80] A. Alshaher, "IT capabilities as a fundamental of electronic government system success in developing countries from users perspectives," *Transform. Gov. People, Process Policy*, vol. 6, no. 3, pp.20-35, 2020.
[81] N. A. Al-Sabbagh and M. Al-Alawi, "The Effect of Cloud Computing on Organizational Flexibility," *Lect. Notes Networks Syst.*, vol. 194, no. 2, pp. 40–51, 2021.
[82] A. Khayer, N. Jahan, M. N. Hossain, and M. Y. Hossain, "The adoption of cloud computing in small and medium enterprises: a developing country perspective," *VINE J. Inf. Knowl. Manag. Syst.*, vol. 8, no. 3, pp. 133-154, 2020.
[83] A. Bounfour, J. Etienne, X. Cheng, and A. Nonnis, "How do firms use cloud computing to transform their organization ? Evidence from a global survey," vol. 1, no. 1, pp. 29–47, 2022.
[84] M. M. Salih, M. A. Ahmed, B. Al-Bander, K. F. Hasan, M. L. Shuwandy, and Z. Al-Qaysi,

"Benchmarking Framework for COVID-19 Classification Machine Learning Method Based on Fuzzy Decision by Opinion Score Method," *Iraqi Journal of Science*, vol. 64, no. 2, pp. 922–943, Feb. 2023.